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No. 1735

ENERGY ECONOMICS:

ITALY'S NATIONAL ENERGY PLAN FOR THE EIGHTIES

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Rome RASSEGNA PETROLIFERA in Italian 28 Nov 80, 5 Dec 80, 12 Dec 80, 9 Jan 81, 16 Jan 81, 23 Jan 81, 30 Jan 81, 6 Feb 81, 13 Feb 81

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The gross domestic product rose constantly between 1965 and 1979, although after 1973 at definitely slower rates and with heavily accentuated cyclic movements.

Energy consumption also developed starting in 1973 at a notably slower pace when compared to the preceding period of time due to reduced economic activities in the production sectors which use much energy and the launching of savings measures.

Average Annual Rate	Period	
	1965-'73	1973-'79
Gross domestic products	5.4%	2.6%
Energy demands	7.1%	0.9%

Petroleum price rises, the crisis in some heavily energy-consuming sectors--these today necessitate an examination of the ratio between economic growth and energy use.

The strong link between an increase in the gross domestic product and energy consumption, which in the past have characterized the progress of the economy, after the oil crisis suffered a certain reduction, dropping below the long-term figure of more than 1.

The phenomenon, which is common in the industrialized countries in general, turns up in Italy with characteristics of its own not only because of the greater difficulties in adjusting the Italian energy system to the new international situation but also because of the difficulties in changing levels and structures of per-capital consumption which are much lower than those of the industrialized countries in general.

1) Paese	2) Consumi pro capite (T.E.P.)		
	1965	1973	1979
3) Francia	2,38	3,57	3,74
4) Germania	3,24	4,39	4,79
5) Italia	1,52	2,51	2,59
6) Gran Bretagna	3,88	4,23	4,21
7) Usa	6,55	8,42	8,53
8) Svezia	4,63	5,85	5,95
9) Giappone	1,56	3,23	3,14

Key: 1--Country; 2--Per-capita consumption; 3--France; 4--Germany; 5--Italy; 6--Great Britain; 7--United States; 8--Sweden; 9--Japan; T.E.P.--tons of petroleum equivalent.

The consumption structure brought an increase in the relative significance of petroleum which in 1965 accounted for 65 percent but in 1973 came to 75 percent, corresponding to 105 Mtep [millions of tons of petroleum equivalent].

Starting in 1973, there was a drastic change in the industrial setup of the petroleum industry when the producing countries assumed control over quantities and prices. But the primary source consumption structure--in spite of the profound international crisis--did undergo only a slight modification in the hydrocarbons area. The gas share rose from 10 percent to 15 percent while the petroleum share dropped from 74 percent down to 68 percent; the solid fuels share remained around 7 percent; nuclear electric energy on the other hand lost ground and hydrogeoelectric energy leveled off around 8 percent.

The degree of dependence on foreign sources, calculated as a supplement to the ratio between national energy source output and domestic consumption, went up even further after 1973, as shown by the following table.

Energy Dependence (percentage figures)

Source/year	1965	1973	1979
Petroleum	92.5	98.9	98.7
Gas	--	11.3	51.6
Solid fuels	79.1	81.8	91.2
Primary electric energy	--	1.9	8.8
Total	74.4	91.8	82.7

It was pointed out that in recent years it had been necessary to import considerable quantities of electrical energy.

Imports of energy products in current values of 1979 exceeded 15 trillion lire or 24 percent of the total imports; looking at energy product exports, we had a negative balance of more than 1i trillion lire as against 2.3 trillion lire in 1973.

In the light of the most recent market developments, the energy supply likewise is increasingly emerging as the central drawback in the development of the economic system, in the absence of a policy of diversification and control of energy demand growth.

In recent years, the cost of the various primary energy sources underwent considerable and profound changes.

In 1973, the cost of calories deriving from petroleum was at a considerably lower level than that of coal; starting with the Kippur war, the cost of petroleum per calorie went up tremendously, exceeding the cost of coal and the gap became ever wider.

The estimate of foreign exchange outgo for energy source imports during the next period of 3 years is tremendous and is more than $80 billion at 1980 prices (Table 2.1./4).

Table 2.1./4. Estimate of Billing Volume for Energy Source Imports in Italy over the Next 3-Year Period (1981-1983) (1) ($ x 10^6), 1980 Prices

	1980	1981	1982	1983	81-83
3) Idrocarburi (1)					
4) Esborso complessivo ($ x 10^6)	25.490	26.380	27.030	27.730	81.140
5) Carbone (1)					
4) Esborso complessivo ($ x 10^6)	1.284	1.365	1.430	1.520	4.315
6) Combustibile nucleare (2)					
4) Esborso complessivo ($ x 10^6)	41	64	70	70	204
		7) Totale fattura 1981-83 importazioni energetiche (milioni di $)			85.659

N.B. I prezzi unitari delle importazioni sono subordinati al mercato internazionale ed alle politiche dei Paesi Opec. Sono quindi soggetti ad imprevedibili ed incontrollabili forti variazioni.
(1) Trattasi di importazioni per consumi esclusi i quantitativi destinati a stock.
(2) Importazioni complessive di uranio naturale e servizi di arricchimento relativi ai consumi dell'anno.

Note: Unit prices for imports depend on the international market and the policies of the OPEC countries. They are therefore subjected to unforeseeable and uncontrollable strong variations.
Key: 1--These are imports for consumption, excluding quantities earmarked for stockpiling; 2--Total imports of natural uranium and enrichment services pertaining to year's consumption; 3--Hydrocarbons; 4--Total outlay; 5--Coal; 6--Nuclear fuel; 7--Total 1981-1983 energy import billing volume (millions of dollars).

2.1.2. By Utilization Sectors

Energy consumption in the main utilization sectors--industry, civilian uses, transportation--remained substantially stationary during the period of 1973-1975, showing a decline in 1974-1975 and a slow, gradual recovery in 1976-1978.

Industry

Energy consumption remained stationary due to the previously mentioned crisis situation in some sectors, the process of production reorganization in favor of sectors that absorb less energy, and finally savings and conservation measures, adopted by the various industries and undertaken mostly on a voluntary basis (in the light of an increase in the added value growth rate of about 2.2 percent annual average).

Electric energy consumption went up at a rate of 3.1 percent annual average, due to a growing degree of mechanization and automation in plants and the increased role of production programs heavily using electric energy.

In the period of 1973-1979, the degree of electric energy penetration as compared to fuel consumption (hydrocarbons, coal) went up.

Civilian Uses

Energy consumption in this sector--which includes agriculture, household uses, commerce, services, and public administration--registered an overall increase of 0.6 percent annual average during the period of 1973-1979 likewise.

Fuel consumption (petroleum products, natural gas, solids) remained practically unchanged, both due to the effect of conservation and savings measures launched and also because of the rise in the price and the reduced construction activities.

Electric energy consumption went up at a rate of 5.9 percent.

Transportation

During the period of 1973-1979, the increase in energy consumption, mostly gasoline and gas-oil, averaged 4.2 percent annual average; the fact is that, after the 1974 and 1975 drop, the demand again went up at high rates.

Increase in gasoline prices which, during some periods of time, did not keep up with inflation, had produced limited containment effects, while there was no public transportation policy and the pertinent structures were not properly adapted.

The average annual development in automotive vehicles likewise went up in 1978 and 1979 after years of definite decline.

The exceptional rise in gas-oil consumption for automotive transportation, especially over the past two years, can be attributed to several factors, including the resumption of industrial production after 1975; the increase in the number of diesel vehicles; the continuing stagnation in railroad and maritime transportation which

continued to lose their shares out of the total volume of commodities transported.

2.2. National Availability of Energy Sources

2.2.1. National Production of Hydrocarbons

The estimate as to future domestic availability of hydrocarbons depends primarily on an evaluation of the gas or petroleum potential which still remains to be discovered.

No matter what the scale, this evaluation offers largely speculative results. The unknowns involved here are such as to render any exercise along these lines rather approximate.

In these cases we can fall back to the resource units already discovered as an index of the petroleum potential, the intensity and density of exploration activities already carried out, the remaining unexplored areas, the thickness of the sedimentary basins, as well as their geological and natural structure.

A critical examination of the research topics that can still be pursued in Italy, on land and on the sea, makes us think that the still available additional potential could be around 500 million tep [tons of petroleum equivalent], including 100 of oil and 400 of natural gas.

The error in this evaluation seems very high; but the general order of magnitude remains valid and it is not such as to enable us to look forward to the possibility of large autonomous resources capable of noticeably in the future reducing Italy's dependence on foreign sources.

2.2.2. Domestic Coal Production

Regarding the availability of boiler coal and lignites, Italy is rather poor in resources.

There is practically only one coal basin that does not contain lignites and it is found at Sulcis in southeastern Sardinia. The coal contained in the basin has been estimated at about 600 million tons although the quantities technically and economically recoverable are probably less than 100 million tec [tons of coal equivalent].

Among other things, this is rather low-quality coal with a very high ash and sulfur content.

The lignite resources likewise are rather modest. Some mining activities are now under way in Valdarno and Umbria and, together, the produce about 1.9 million tons per year, used in thermoelectric power plants near the mine.

2.2.3. Renewable Sources (Water, Geothermal, Solar, Biomass, Etc.)

Italy is one of the countries with the highest hydroelectric potential utilization rates.

The latest power increases, available during wintertime peak hours, apart from considerations of an economic nature (considering, in other words, also plants with double the production cost when compared to the suitable limits under current conditions on the energy market), are around 3,000 Mw of new power with an average annual production capacity of 5,500 GWh.

In the geothermal field likewise, Italy is among the countries with the highest potential, both in terms of electrical output, and for other uses. Assuming the best possible utilization pattern for electrical purposes (from hydrothermal systems going as far as 3,000 m), we can anticipate an additional annual output of 1.5 TWh; on the other hand, if we use the available geothermal resources with low enthalpy, the technical resources could be considerable.

Prospects for the utilization of solar energy and other renewable sources also look worthwhile because of the contribution they might make.

2.2.4. Uranium

The country's natural uranium resources are very modest and can be estimated at around 3,000 t of U_3O_8, including 1,500 in the Novazza deposit and 1,500 currently undergoing definite evaluation in Vedello Valley. The output of the Novazza mine has been estimated at 150 t/yr.

2.3. Restrictions in Petroleum Supply and Vulnerability of Italian Energy Systems

The previously outlined estimates regarding the future worldwide petroleum supply point to a picture which is anything but reassuring.

Let us review the essential features of that situation.

A. The production capacity is not able to maintain demand growth rates similar to those of the past.

B. Even if we assume that the consuming countries hold their demand down considerably, the supply level might still be inadequate because it is regulated by the political decisions of the producing countries.

C. The political risk which today hangs over the international petroleum market has become very great and it is difficult to imagine that, over the next decades, there would not be severe difficulties connected with the phenomenon of local or general political instability.

In the context of this scenario, the examination of the Italian situation has revealed that the country does not have adequate energy resources of its own to take care of its consumption levels. The current degree of energy dependence on foreign sources thus is destined to exist for a long time.

Secondly, it turns out that petroleum occupies a preponderant position in the domestic energy situation.

These conditions therefore underscore the rather shaky nature of the Italian energy system. As a matter of fact:

Every petroleum price rise has repercussions in Italy to a much greater extent than the average of the Western countries;

Any possible major blockage of petroleum supplies would create a grave crisis for the West but in Italy it would assume the characteristics of a real and proper economic disaster.

In substance, the current Italian energy system, founded on the predominance of petroleum, features and amplifies the particular traditions of physical and economic insecurity tied to the availability of petroleum throughout the world.

Italy must therefore take action early in order to reduce the vulnerability of the Italian energy system by working in several directions. Without these efforts, the nation's energy needs would in 1990 come to 220 million tep and petroleum consumption could rise 150 million tep with notable coverage problems.

The matter of holding energy consumption down must furthermore be viewed in the light of another significant circumstance: Italy's per-capita energy consumption today is definitely below the levels in the other Western countries and that naturally makes it more difficult and costly to limit its growth.

Italian energy development therefore will have to be brought about by working in two opposite directions: on the one hand by holding down the energy consumption growth rates to avoid the destabilizing effects of supply crises and, on the other hand, to guarantee the energy necessary for the country's growth.

2.4. Objectives and Lines of Action for an Energy Policy in Italy

2.4.1. Preliminary Considerations

The purpose of this energy plan therefore is to guarantee the country energy availability at levels that will be compatible with orderly economic growth and at costs comparable to those of the other industrialized countries.

More precisely, the objectives of the plan--which includes projections up to the year 2000--are summarized as follows for 1990:

(a) Adoption of a vigorous energy savings policy and more efficient use of energy in all consumer sectors so as to hold the energy demand down within the limit of 200 Mtep;

(b) Reduction of current dependence on petroleum (68 percent in 1979) down to 50 percent of the total energy need, holding crude imports down to about 100 million tons, developing the use of alternate and concurrent sources, especially coal, nuclear, gas, and renewable sources;

(c) Maximum possible development of domestic energy sources;

(d) Reduction of energy supply risks through diversification not only in terms of sources but also in terms of supplier countries and creation of adequate strategic reserves;

(e) Technological and policy decisions concerning supply which will help the Italian industrial system improve and sell its own products and systems on the international market.

The steps adopted so far and the spontaneous tendencies toward savings, as required by the new price levels, appear insufficient when it comes to guaranteeing a growth in consumption that will be compatible with the above-mentioned objectives.

The plan's basic objective is to hold the overall energy demand by 1990 down to a figure of around 200 million tep through a series of "active" steps to hold consumption in all sectors down.

The savings objectives drafted in this plan (about 20 Mtep/year by 1990) represent a job that is anything but easy; its attainment demands the kind of energy policy which, once started, would be pursued with the necessary determination and with the consensus of the social partners involved.

The full success of the "active" steps is an essential prerequisite for an energy consumption increase which will permit a development of the gross domestic product at an annual average increase rate between 3.0 percent and 3.5 percent during the period leading up to 1990.

These figures on the one hand are the minimum figures compatible with those recently worked out on the international level by a study group attached to the Community and chaired by Prof Saint Geours; the study revealed that the major investments necessary to work toward a solution of the energy problem, both through the development of alternate sources, other than petroleum, and through energy conservation, will be possible only in a climate of relatively sustained economic expansion and, furthermore, they must be such as not to aggravate the serious employment problems and the problems connected with the territorial imbalance in Italy.

It may thus be necessary to introduce more stringent and restrictive standards regarding the use of energy, essentially tied to the materialization of petroleum supply crises; this point will be covered in Paragraph 5.1.

The plan calls for maximum possible recourse to all alternate sources other than petroleum, compatible with the time frame for the implementation of the necessary projects and infrastructure facilities in all those sectors where they can be used more easily (electric energy production, civilian uses, etc.) so as to reserve petroleum for uses where substitution is more difficult (highway and air transportation, petrochemistry, etc.).

The plan's objective's--in line with the anticipated development of the worldwide energy panorama--will be achieved through a coherent and indispensable complex of actions and steps.

Any slippages or delays in the adoption of these provisions or in the implementation of the projects involved will inevitably be expressed in increases in the construction of crude or in reductions of the economic activity level with negative consequences on the entire social system.

Table 2.4./1. Final Uses of Energy in Italy (millions of tep)

	1978	1985 (obiettivo) 3)	1990 (obiettivo) 3)	1990 (tendenziale) 4)
5) Alta temperatura	21.1	22.8	24.0	27.3
6) Media temperatura	7.4	8.0	8.2	9.4
7) Bassa temperatura	31.0	32.7	34.4	39.4
	59.5	63.5	66.6	76.1
8) Carburanti (1)	22.8	27.5	31.5	35.0
9) Energia elettrica obbligata (2)	11.7	17.2	21.9	24.0
10) Totale usi finali	94.0	108.2	120.0	135.1
11) Totale fonti primarie	144.1	175.0	200.0	220.0

(1) Esclusi bunkeraggi marittimi ed aerei e compresi carburanti per agricoltura ed industria.
(2) 860 Kcal kWh.

Key: 1--Excluding maritime and aviation oil and including fuels for agriculture and industry; 2--860 Kcal/kwh; 3--Target; 4--Trend; 5--High-temperature; 6--Medium-temperature; 7--Low-temperature; 8--Fuels; 9--Mandatory [committed] electrical energy; 10--Total final uses; 11--Total primary sources.

Table 2.4./2. Breakdown by Sources and by Sectors of Italian Energy Consumption by 1990 (Mtep)

4) Disponibilità non petrolifere previste nel Piano	1979	5) 1985 (obiettivo)	5) 1990 (obiettivo)	6) 1990 (tendenziale)
7) Gas naturale prodotto e importato (1)	22,9	28,9	37,0	37,0
8) Carbone prodotto e importato (2)	11,4	17,7	36,0	36,0
9) Fonti rinnovabili	—	0,5	2,0	2,0
10) Elettricità primaria (3)	12,3	12,5	21,6	21,6
11) TOTALE DISPONIBILITA' NON PETROLIFERE	46,6	59,6	96,6	96,6
12) **Fabbisogni di petrolio per usi non sostituibili**				
13) Petrolio per carburanti, bunkeraggi e petrolchimica	37,1	41,8	48,2	52,0
14) **Fabbisogni di petrolio per usi sostituibili con altre fonti**				
15) Usi termici	34,6	30,7	23,3	32,8
16) Usi termoelettrici	22,0	34,4	23,9	29,4
17) Totale	56,6	65,1	47,2	62,2
18) Totale generale	140,3	165,5	192,0	210,8
19) Consumi e perdite del settore petrolifero	7,5	8,5	8,0	9,2
20) Consumo complessivo in fonti primarie	147,8	175,0	200,0	220,0

(1) Di cui per usi teormoelettrici: gas naturale 2,3 Mtep nel 1979, 2,5 Mtep nel 1985 e 3,0 Mtep nel 1990.

(2) Di cui per usi termoelettrici: carbone (inclusi lignite, bassi prodotti e gas derivati): 3,5 Mtep nel 1979, 6,7 Mtep nel 1985 e 24,0 Mtep nel 1990.

(3) Idroelettrica, nucleoelettrica, geotermoelettrica.

Key: 1--Including for thermoelectric uses: natural gas 2.3 Mtep in 1979, 2.5 Mtep in 1985, and 3.0 Mtep in 1990; 2--Including for thermoelectric uses: coal (including lignite, low-grade products, and derived gases): 3.5 Mtep in 1979, 6.7 Mtep in 1985 and 24.0 Mtep in 1990; 3--Hydroelectric power, nuclear electric power, geothermal electrical power; 4--Availability of sources other than petroleum as provided for under the plan; 5--Target; 6--Trend; 7--Natural gas produced and imported (1); 8--Coal produced and imported (2); 9--Renewable sources; 10--Primary electricity (3); 11--Total available volume of sources other than petroleum; 12--Petroleum needs for nonreplaceable uses; 13--Petroleum for motor fuel, fuel oil, and petrochemistry; 14--Petroleum requirements for uses replaceable with other sources; 15--Heating uses; 16--Thermoelectric uses; 17--Total; 18--Grand total; 19--Consumption and losses in petroleum sector; 20--Total consumption of primary sources.

2.4.2. Quantitative Estimates of Energy Needs by 1990

The estimated energy demand as of 1985 and 1990 has been figured both for final uses and by utilization sectors. The first approach made it possible to check the congruences between the economic and population development assumptions and the energy demands. The analysis of final energy uses as a matter of fact brings out the different potentials existing for savings and for the more effecient use of energy in various sectors.

We thus estimate the anticipated results both from steps of a structural type and from those aimed at the improvement of energy efficiency.

Thermal uses are subdivided into three temperature phases: high (uses of energy in the form of heat and temperatures above 250°); average (temperature between 110° and 250°), and low (less than 100°). It must be emphasized that high-temperature uses are connected with industry, medium-temperature uses are connected partly with industry and partly with the household sector and the tertiary sector (kitchen use), while low-temperature uses (heating and hot water) are found mostly in the residential and tertiary sector. All heating uses are expected to grow by 1990 at variable rates between 0.9 percent and 1.1 percent. This is a rather restrained development precisely because of the steps provided for under the plan and the great savings potential especially characterizing low-temperature uses (Table 2.4./1).

The demand for motor fuels, used mostly in the transportation sector and to a very minor degree in agriculture and the construction industry, is expected to rise to a rate of around 2.7 percent per year in connection with the rationalization and consumption containment policy.

The expectations regarding the demand for electric energy for mandatory uses, that is, for uses where this source cannot be replaced (lighting, power, etc.) rules out any savings steps, with results that cannot be compared to those anticipated for thermal uses. Although they turn out to be less than the theoretical growth potential in the absence of supply restrictions, these types of consumption as a matter of fact are going to increase at an average annual rate of 5.4 percent until 1990.

Meeting the complex energy demand through various sources must be defined by keeping in mind first of all the technical relationships of replaceability between the various sources; second, the anticipated development of their prices; third, the decisions already made regarding the availability of energy; and finally, the further increases in the available volume which can be anticipated by the end of the plan. Table 2.4/2 shows the results expected from the policy for the development of sources other than petroleum as spelled out in the plan; for the residual portion of energy needs, not covered by these alternate sources, we will necessarily have to fall back on petroleum. The foreseeable future consumption of petroleum is therefore divided into two parts: the first part dealing with the nonreplaceable uses of this energy source and the second part dealing with uses where there are further possibilities of substitution. The choice between the various sources which we must fall back on, during the years after 1990, due to the reduction of this latter area, will depend on a complex of circumstances that are difficult to anticipate (relationships between prices, creation of infrastructure, etc.). Reference is made to this problem in Paragraph 2.4.6.

The way to cover the primary sources to meet the energy needs anticipated until 1990, in line with the actions spelled out in the plan, is presented Table No 2.4/3.

Table 2.4./3. Meeting Primary Energy Source Needs in Italy in 1985 and 1990 (Mtep)

3) Fonti primarie	1979	1985	1990
4) Petrolio	100.6	115.4	103.4
5) Combustibili solidi	11.4	17.7	36.0
6) Gas naturale	22.9	28.9	37.0
7) Idro-geo (1)	10.0	10.5	11.6
8) Nucleare	0.0	2.0	10.0
9) Altre rinnovabili	—	0.5	2.0
10) Importazioni energia elettrica ed extraidraulicità (2)	2.3	—	—
Totale	147.8	175.0	200.0

(1) I dati si riferiscono, per la produzione idroelettrica, a quella realizzabile dai soli apporti naturali, in condizioni di anno idrologico «medio».

(2) Il dato indicato per il 1979, oltre ad una notevole importazione di energia elettrica (1.2 Mtep) include la maggior produzione idroelettrica dovuta ad una idraulicità particolarmente elevata e la produzione da impianti di pompaggio

Key: 1--The figures refer--for hydroelectric production--to those which can be achieved through natural contributions alone, under conditions of "average" hydrological years; 2--The figure given for 1979--in addition to considerable electrical energy imports (1.2 Mtep)--includes the greater hydroelectric production due to particularly large water supply volumes and the output from pumping plants; 3--Primary sources; 4--Petroleum; 5--Solid fuels; 6--Natural gas; 7--Hydrogeo[thermal] (1); 8--Nuclear; 9--Other renewable sources; 10--Electric energy imports and surplus water supply (2); 11--Total.

Petroleum consumption by 1990 (103 Mtep) remains practically unchanged as compared to the figure recorded in 1979 (100 Mtep), thus attaining the objective of reducing dependence on petroleum to about 50 percent of the total energy need by 1990 (51.7 percent).

The reduction is obtained through greater use of natural gas, coal, and nuclear power, making it possible to hold petroleum consumption down in nonmandatory uses from 38.2 percent in 1979 to 22.6 percent in 1990.

The increase in natural gas consumption is largely compensated for by the reduction in the petroleum source; as a matter of fact, the total hydrocarbons consumption volume (petroleum plus natural gas) will drop to 70.2 percent of the total energy needs by 1990, as against 83.6 percent registered in 1979.

The contribution from renewable sources, in percentage terms, by 1990 remains 6.8 percent as in 1979 thanks to the increase in "other renewable sources" which compensates for a reduction in hydro-geo[thermal] sources.

2.4.3. Contribution from Domestic Sources

By 1990, the contribution from domestic sources is expected to be as follows:

The natural hydroelectric production capability, in an average hydrological year, will go up from the current figure of 44.5 TWh/year to 50TWh/year in 1990; for this purpose we are going to build a large portion of those plants which can still be put up and we are going to reactivate all of the little plants which had been closed down;

Geothermoelectrical production will rise from the current 2.5 TWh/year to 4.0TWh/year; this estimate is based on a high level of success in research now in progress and planned;

The contribution from "new" sources, mostly solar energy, will come to 2 Mtep/year due to the completion of the "renewable sources" project;

The production of natural gas--for the purpose of contributing to the creation of a strategic reserve--will drop from the current 7.5 billion cubic meters to 7-8 billion cubic meters in 1990, while it will be necessary further to step up prospecting activities so as to find new domestic deposits;

Petroleum output will rise from the current 1.8 Mtep to 2.5 Mtep in 1990;

Production of solid fuels, essentially coal from Sulcis and lignite, should exceed 2 Mtep.

The contribution from domestic sources in the strict sense of the word (in other words, excluding nuclear energy) will thus come to about 25 Mtep. To meet the residual needs as compared to the target assumption of 200 Mtep, it will be necessary to resort to imports to the extent of 175.3 Mtep.

2.4.4. Energy Source Imports

The contribution from imported coal should come to 55 million t by 1990, corresponding to 34 Mtep. This will imply a major increase in the use of coal for nonelectrical uses and the implementation of an expanded program of new coal-powered power plants, according to the directive issued by the CIPE [Interministerial Committee for Economic Planning] on 11 January 1980.

The attainment of this development objective will involve a series of major efforts, spelled out in the pertinent draft, to put up infrastructure facilities and to select sites and obtained authorization for new power plants. The maximum contribution we can assume here, again by 1990, for imported gas is 31.4 Mtep (or about 38 billion cubic meters), of which about 24 Mtep have already been procured on the basis of contracts; the gas program draft indicates the actions necessary to permit this major increase in natural gas consumption, particularly regarding the transportation and distribution facilities.

The contribution from nuclear energy must, by 1990, reach a figure of at least 10 Mtep through the rapid selection of sites for the installation of at least 4,000 Mw, plus 2,000 Mw from the Montalto di Castro power plant. In the meantime it will be necessary to launch studies for the selection of the sites for the other six units provided for under the ENEL [National Electric Power Agency] plan.

Petroleum would contribute only 103 Mtep to meeting our energy needs, including 101 Mtep from imports, corresponding to a little more than 50 percent of the country's energy demands.

2.4.5. Consequences of Possible Delays in Plan Implementation

The objective of holding petroleum imports down by 1990 within a limit of 105 Mtep could be achieved only if all of the actions provided for under the plan are promptly launched and brought to fruition within the deadlines provided for; and that includes steps aimed at holding down the demand and achieving a maximum possible increase in the contribution from all sources to be used as alternatives to imported petroleum. Failure to implement the plan or implementing the plan only partly in terms of any of these steps or a simple delay in its implementation, as compared to the time frame indicated in the plan, would as a matter of fact lead to a corresponding increase in petroleum needs anticipated for the next decade, with the subsequent aggravation of the already serious supply problems in terms of reliability of supply flow and payments going abroad.

To quantify these consequences, we might note that, on the demand side, any delays in the implementation of the steps provided for in the savings and efficient energy use field, will entail a greater need for imported petroleum which, for example, in case of 50-percent success of conservation actions indicated in the plan, would come to 10 Mtep.

On the supply side, the results expected from the plan would amount to an increase in the contribution from sources other than imported petroleum coming to more than 53 Mtep, as compared to the current approximately 47 Mtep, under normal water supply conditions and with imports of electrical energy; out of that increase, about 10 Mtep would have to be considered to have been procured, deriving from actions already launched or actions not requiring any further steps in terms of authorizations standards, or financing (construction of Algerian pipeline, hydroelectric power plants under construction, conversion of power plants to coal now in progress, etc.), while the remaining 42 Mtep are strictly tied to the full implementation of the actions spelled out in the present plan by the deadlines specified.

Still assuming a partial success of 50 percent, the imported petroleum demand by 1990 nevertheless would grow by 21 Mtep for this reason alone.

Overall, therefore, the cumulative effects on the demand side and the supply side, as deriving from the accomplishment by 1990, of only one of the goals listed under the objectives of the plan would raise the imported petroleum needs to 132 Mtep by that date; supplying this quantity would create extremely serious problems in terms of obtaining that quantity on the market; this would also create a situation of political and economic conditioning which in all probability would be incompatible with even minimum growth levels for Italy.

In this general situation, one particularly critical aspect involves electric energy because of its importance in the process of diversification of sources, because of the time required to build the new power plants, and because of the direct implications regarding all sectors of the economy which the availability and cost of this form of energy entailed.

Concerning the contribution from electric energy to the diversification of sources, it must be noted that, out of the 52 Mtep which, as we saw, constitute the overall increase from contributions deriving from sources other than imported petroleum, about 32 Mtep will depend on the completion, by the proper deadlines, of a complex of new electric power plants, that is to say, the completion of specifically defined plants which will make a decisive contribution to the diversification which can be expressed in quantitative terms with certainty; but, due to the delays in site selections already accumulated, only a small part of these plants (3 Mtep) is now under construction while almost all of them (29 Mtep) are strictly tied to the precise and urgent implementation of steps spelled out in the plan, particularly regarding the new coal and nuclear power plants.

The operational availability of the new power plants will demand a sequence of successive implementation phases (identification of site, completion of surveys and administrative procedures involved in getting the necessary authorizations, construction of power plant, time between the active commissioning of the various sections within one and the same plant, start-up and acceptance phases); for each of these phases, the plan calls for maximum possible containment of relative duration as an essential prerequisite for the attainment of the objective indicated. (For example, regarding the new coal-powered power plants, provided under the plan, for a total of 16,600 Mw--see Paragraph 3.1./2, Chapter 3--the commissioning dates are as follows: 640 Mw in 1983-1984, 240 Mw in 1985, 640 Mw in 1986, 1,960 Mw in 1987, 4,600 Mw in 1988, 4,920 Mw in 1989, and 3,600 Mw in 1990.

The reduction in the time frame entails a major technical and organizational effort as well as full commitment and collaboration on the part of the central and local authorities concerned. Nevertheless, the completion dates remain on the order of 5-8 years, depending upon the type of power plants we are talking about; this means that some delay in starting the individual sequences and/or in the completion of the various subdivisions will lead to noticeable reductions in the contributions expected for the year 1990. If, for example, the construction of coal and nuclear power plants is started with a delay of only one year, even though the minimum target dates are attained in the actual construction work, it will not be possible to avoid a reduced overall contribution by 1990 from alternate sources amounting to about 7 Mtep, which is equivalent to one-quarter of the total contribution, and hence a greater equivalent fuel oil consumption in the existing power plants. Since a delay by one year would furthermore bring about an in-service output capacity reduction of 6,500 Mw, we might furthermore be facing serious problems regarding the very continuity of electric power service.

The absolute need for attaining the objectives of diversifying the energy sources used for the production of electric energy to the fullest possible extent furthermore appears evident also for reasons of competitiveness of the Italian production system when we realize that in this case likewise, the Italian electrical energy production structure in 1990 would continue to be less favorable as compared to that of the bigger European partners. This diverse structure--although determined by delays that have accumulated in the selection of the sites for the new nuclear and coal power plants, places Italy in a position of greater dependence on hydrocarbons when compared to the situation of other countries, where we find a high rate of nuclear and coal production; that means that the Italian electrical energy production balance sheet--and hence the rate schedule level--are destined to go up progressively in terms of time to a greater degree than in the other countries, in relation to the high dynamics of the price of the energy source prevailing in Italy.

This phenomenon--which will naturally have a major effect on domestic industrial establishments which use much electrical energy--would be further aggravated, with serious consequences, if there were to be any further delays in the implementation of the program for the construction of new electric power plants as provided for under the plan.

2.4.6. Investments and Incentives Provided in Plan

In the following chapters we will present the investments anticipated in the energy sector and the incentives which must be given for rationalization and energy savings programs in the individual utilization sectors as well as for the promotion of renewable source development.

Regarding investments in Italy in the energy sector provided for the decade of 1981-1990, we have the following picture:

Billions of Lire (at 1980 Prices)

	1 triennio 81/83	2 periodo 84/90	2 periodo 81/90
3 - Attività mineraria idrocarburi e ciclo petrolifero	5 o50	11.500	17.150
4 - Gas naturale	1.700	1.600	3.300
5 - Carbone	1.150	9.950	11.100
6 - Nucleare	2.350	10.400	12.750
7 - Idroelettrica	1.200	3.900	5.100
8 - Geotermia	300	700	1.000
9 - Rinnovabili (solare, etc.)	350	1.050	1.400
10 - Trasmissione e distribuzione dell'energia elettr.ca	3.900	8.500	12.300
11 Totale	16.500	47.600	64.100

Key: 1--3-year period; 2--Period; 3--Mining activities, hydrocarbons, and petroleum cycle; 4--Natural gas; 5--Coal; 6--Nuclear; 7--Hydroelectric; 8--Geothermal; 9--Renewable (solar, etc.); 10--Electric energy transmission and distribution; 11--Total.

Regarding investments for the 1981-1983 3-year period, the amount of 16,000 billions represents about 1.5 percent of the gross domestic product turned out during the same period of time and 7.5 percent of the fixed asset investments. These figures appear compatible with the country's economic resources when we realize that, during the past several years, which were characterized by a slowdown in investments in the energy sector, the investments of that sector, for the enlarged public portion alone, represented about 1 percent of the gross domestic output; since the enlarged public sector contributes 85 percent of the implementation of the anticipated investments, the amount of the energy investments from the public sector out of the gross domestic output will, during the 3-year period, come to 1.3 percent, approximately, in other words, a very moderate increase.

The overall evaluation of investments provided for in Italy over the entire decade of 1981-1990 appear compatible with respect to the gross domestic product (1.5 percent) and the fixed asset investments (less than 8 percent).

The dimension of investments provided for, although considerable, is only a limited fraction when compared to the costs which the country must bear in order to meet the energy needs. For example, during the 1981-1983 3-year period, Italy will have to put up with a total outlay that can be estimated at 80 trillion lire (at current prices), going abroad for the purpose of importing energy sources. After that, the diversification steps undertaken under the investment program will contribute to the reduction of the outlay connected with energy imports.

The Plan also calls for a series of investments abroad in the hydrocarbon sector, in the coal industry and in the uranium mineral industry, that is to say, in sources which will decisively contribute to our meeting our energy needs; this involves about 3 trillion lire during the 3-year period of 1981-1983 and about 12 trillions for the entire decade. These investments, which are intended to improve the reliability and diversification of the flow of supplies, will not entail any major foreign exchange outlays in view of the financing conditions characterizing these activities. By way of example, during the first 3-year period, with investments amounting to about 3 billions, we anticipate a foreign exchange outlay of something like 10 percent.

The Plan furthermore calls for resorting to the instrument of incentives for the development of efficient energy use and the employment of renewable sources.

The incentives for conservation are aimed at the completion of demonstration projects and the accelerated dissemination of steps in various utilization sectors so as, in overall terms, to permit a 10-percent reduction in the energy demands by 1990 (20 million tep); the incentives for the development of renewable sources are aimed at guaranteeing their inclusion in the progressively growing domestic energy balance which, by the year 1990, can be estimated at 2 million tep.

It appears difficult to estimate the amount of overall investments which are going to be made during the entire decade in the savings and renewable sources sectors, given the enormous number of sectors and users involved, whose behavior one cannot possibly predict; we can however estimate that the spending directly resulting from the incentives provided for under the plan will be between three and four times of the incentives themselves.

Here is a recapitulation of the public allocations provided for incentives:

Billions of Lire (at 1980 Prices)

MILIARDI DI LIRE (a valore 1980)

	1 triennio 1981-1983	2 periodo 1984-1990	2 periodo 1981-1990
3 Residenziale	750	2.250	3.000
4 Agricoltura	50	50	100
5 Cogenerazione	80	170	250
6 Industria	750	1.650	2.400
7 Trasporto	1.200	2.050	3.250
8 Totale	2.830	6.170	9.000

Key: 1--3-year period; 2--Period; 3--Residential; 4--Agriculture; 5--Combined power generation; 6--Industry; 7--Transport; 8--Total.

2.4.7. Initial Conclusions

The effort to be made in order to attain the targets established for 1990 presupposes the development of a series of specific actions which are described analytically and which can be summarized as follows:

Implement an active conservation policy capable of saving, by 1990, energy amounting to at least 20 million t of petroleum (compared to the assumption of "tendential development") in the presence of very low per-capita consumption figures (Paragraph 4.1, 4.2., 4.3, 4.4, and 4.5).

Guarantee petroleum consumption, by 1990, less than the maximum anticipated for 1985-1986 through diversification of sources (Paragraph 3.4);

Put up an integrated system of infrastructure facilities and works projects capable of supplying, transporting, receiving, and consuming more than 50 million t of coal per year, in other words, triple the current levels (Paragraph 3.1);

Almost double the current gas consumption levels; this implies the completion of the methane pipeline network in the South and the doubling of the gas pipeline with Algeria (Paragraph 3.2);

Within the time frame provided for in the new ENEL 10-year plan, build the new coal and nuclear power plants (in addition to the one already under construction at Montalto di Castro);

Develop the technologies and applications for solar energy (especially in the housing construction sector) which in 1990 will have to contribute around 1 percent to meeting the total energy needs (Paragraph 3.5);

Provide for the instruments and policies which must be used in emergency situations that might arise in petroleum supply (Paragraph 5.1);

Analyze the problems of industrial establishments with high electric power consumption (Paragraph 5.2);

Study the problems connected with scientific research and technological innovations (Paragraph 5.3);

Tackle environmental problems which have arisen or which might arise from industrial growth and particularly from the use of energy sources different from those developed in the past (Paragraph 5.4);

Develop an information policy dealing with real problems and presenting the truth (5.5).

For each of these "actions" we also have the initiatives to be launched over the next 3 years and the persons or agencies to be charged with the attainment of the objectives. The attainment of the plan's target requires tremendous political and financial commitments and demands the mobilization of all technical and entrepreneurial resources as well as the use of social forces. The failure fully to attain the targets proposed will inevitably lead to an increase in petroleum consumption and hence to the failure to attain the plan's fundamental objective. For each source as well as for all horizontal actions (savings, research, information, environment), specific investment steps have been listed.

A measure of the effort to be made is given by the direct investments, connected with the energy plan; most of these investments however will be carried out in Italy, with domestic labor and thus with a considerable effort involving Italy's entire economic and industrial system.

The last chapter, Chapter 6, finally, is devoted to problems of the industrial establishment as a whole as well as the legislative and normative components which must in the end be launched and resolved if we want to give Italy not only instruments of investigation and fact-finding but also administrative structures capable of launching decisive policies and supervising their practical implementation.

2.4.8. Prospects for the Nineties

It seems rather problematical to come up with any assumptions regarding energy needs by the year 2000; but it is extremely likely that the basic scenario, outlined for the eighties, will continue also for the next decade with qualitatively similar features. The energy strategies for those years, in other words, will reveal the same features as those spelled out so far.

By way of indications by the year 2000, the maximum anticipated contribution from domestic primary sources can be figured at 34 Mtep, distributed as follows: geothermal and solar energy will contribute about 10 Mtep per year by 2000; hydroelectric sources, even assuming total resource utilization, will not be able to go beyond 12 Mtep per year, while the contribution from domestic natural gas will remain around 6.5 Mtep per year, the contribution from petroleum will be about 2.5 Mtep per year, and the contribution from domestic solid fuels (Sulcis coal) will be about 3 Mtep per year.

The remainder of our needs--which in the year 2000 will inevitably have to be covered with imports of hydrocarbons and coal and by resorting to nuclear energy--by way of assumption can be estimated at around 185-205 Mtep. During the sixties however a share of this need (about 72 Mtep) appears destined to be covered by energy sources through the utilization of pertinent plants and infrastructure facilities; we are talking here particularly about coal-powered and nuclear power plants (the latter being estimated here on the assumption that we accomplish the construction of the entire complex of 12,000 Mw) and natural gas transportation and distribution infrastructures: for the remainder of our needs (114-134 Mtep), we are going to have choices involving the energy sources to be adopted; in this context, considering the fact that petroleum availability during the nineties will have gone down and that supplies will be more expensive, we detect the need for greater recourse to nuclear energy and we have to prepare ourselves for that right now.

Although the year 2000 may still appear to be far off, it must as a matter of fact be realized that the energy choices entail very long-term implementation deadlines (up to 10-12 years). We thus understand that the investigations to be conducted and the pertinent decisions can be postponed only for just a few more years; this, among other things, justifies the decision to make this energy plan "operational," providing for its updating between now and the next 3 years.

[5 Dec 80, pp 1060-1062]

[Text] Coal, Natural Gas

> In this installment we report the first part of Chapter XXX, entitled "Policies and Acts To Be Undertaken in the Field of Principal Sources" under the National Energy Plan, dealing with coal and natural gas.

3.1. Coal

3.1.1. Current Situation

Right now, mineral coal consumed in Italy is used in the following manner:

Lignite--thermoelectric use in power plants at the mine;

Steam-generating [boiler] coal--thermoelectric, industrial, civilian uses;

Coking coal--in plants production of coke, essentially for metallurgical uses.

The slight drop in coking coal consumption in recent years on the other hand was counterbalanced by a major resumption in boiler coal use as we can see from the following table.

Table 3.1./1 (data in 10^3 t)

	1976	1977	1978	1979
Lignite	2.060	1.870	1.910	2.080
1) Carbone da coke	11.100	10.400	10.500	10.160
2) Carbone da vapore	1.830	2.140	2.510	4.400
3) di cui: Enel	1.330	1.560	2.070	3.650
4) usi industriali	240	310	310	600
5) domestico e trasporti	260	270	130	150

Key: 1--Coking coal; 2--Boiler coal; 3--Including: ENEL; 4--Industrial uses; 5--Domestic and transportation.

Boiler coal is supplied mostly from South Africa and Poland. The coal used by the ENEL is delivered directly to the port wharf of the power plant primarily with ships of 80,000 tpl [GRT] (La Spezia) and 50,000 GRT (Vado Ligure and Fusina). The other users get their boiler coal above all from the public wharf at Savona (35,000 GRT) and a small quantity at Porto Marghera (20,000 GRT). Domestic transportation is handled by railroad or highway.

Coking coal (coming from the United States, West Germany, Australia, Poland, the USSR, and Canada is received directly at the plants of the Finisder [Iron and Steel Finance Corporation] group (at Taranto with ships of up to 150,000 GRT at a ship-wharf capable of accommodating ships of up to 300,000 GRT and at the other establishments with ships of up to 80,000 GRT, with some limitations) and by ENI [National Hydrocarbons Agency]-SAMIM (at Vado with ships of 45,000 GRT and at Avenza and Marghera with ships of 35,000 GRT). It is noted that, for the supply and movement of coking coal, we have confirmed quantitative data giving us a figure in excess of 10 million tons per year.

The list of traditional sources evidences the high degree of geographic diversification of the origins which the users have been able to be connected with, in spite of serious quantitative restrictions.

The forms of supply are also amply diversified: report on supply transactions covering many decades, in some cases backed up by government action--especially supranational--along with financial contributions (policy of promoting exchange of coking coal within the Community).

Recourse to long-term contracts during the start-up phase of new mining initiatives has also brought about an expansion in the supply which calmed prices down, so to speak, guaranteeing the user, entering into such contracts, a priviliged position among the group of customers of the new enterprises.

The problem of transportation, receiving, and movement of considerable quantities of coking coal now used has also been solved adequately.

Boiler coal consumption at the power plants of ENEL more than tripled within just a few years, rising from 1.5 million t in 1977 to an anticipated 5 million t in 1980.

This rapid increase has entailed supply problems as well as transportation and distribution problems in the current infrastructure situation as described earlier; these problems were solved satisfactorialy through the stipulation--in the long-term supply contract--of the use of 80,000-GRT ships not loaded completely for long-distance transportation and various expedients installed for the resupply of the power plants (lightening the big ships in the first port of arrival, transshipment, use of ocean-going lighters, etc.).

Over the past 3 years, prospecting and mining participation abroad by ENI has taken shape with the aquisition of considerable reserves.

All of these elements together constitute a strong base for further development and make us think that Italy has enough experience and capacity to cope--during the next decade--with the almost quadrupling of coal consumption anticipated under the plan, provided the actions outlined below are fully and punctually carried out.

3.1.2. General Objectives

With reference to the next decade, the plan proposes:

(a) The definition of a consumption target in relation to the complexity of the system;

(b) The definition and implementation of a supply strategy;

(c) The identification and implementation of the necessary infrastructure facilities;

(d) The identification of problems of an environmental nature and their solution through adequate instruments;

(e) Development of new technologies;

(f) Evaluation of necessary investments.

3.1.3. Consumption

The increase in coal consumption is a specific objective of the country's energy policy and therefore must not be the product of the manifestation of the usual market mechanisms, pushed along by petroleum cost increases, but must instead be pursued with adequate instruments.

With this in mind, consumption estimates have been worked out for the time leading up to 1990 and these estimates are to be considered as maximum attainable objectives through any actions or steps under the conditions specified. The analysis is made for the main utilization sectors.

ENEL Power Plants

The new programs of the ENEL, drafted on the basis of directives contained in the CIPE document of 11 January 1980, provide--depending upon the early procurement of the necessary authorizations--for the use of coal in thermoelectric power plants according to the following prospects.

Table 3.1./2

Power Plants	Capacity, Mw		Coal Consumption, t(*) 10^6	
	1985	1990	1985	1990
Power plants operational in 1980	4,790	4,790	6.0	5.0
Power plants undergoing conversion:				
Conversion by 1985	3,040	3,040	3.0	3.0
Completion of conversion after 1985 (equipment)	--	--	--	2.0
New conversions	--	640	--	1.0
New power plants programmed	--	16,600	--	27.0
Total consumption	--	--	9.0	38.0

(*)In addition to the above-mentioned consumption figures, ENEL is planning to use lignite from its own deposits to the extent of about 2 million t/year in 1985 and 1.5 million t/year in 1990.

Metallurgical Uses

During the next several years, the absorption of coal in the steel industry will grow in a rather restrained fashion.

Finsider anticipates an increase in its coal consumption from a level of 8.2 million t recorded in 1979 to 11 million t in 1985 and 12 million t in 1990.

The consumption of coal used in the coking plants of ENI-SAMIM will be around about 2 million t/year.

Industrial Uses

After the thermoelectric sector, the sector of industrial uses is susceptible to the greatest increase in consumption.

As a general remark we might say that this sector could be available for conversion of plants if the relative price of coal as compared to petroleum were to maintain its current advantage. The availability of the industry for conversion is only a function of the economical aspects of the operation and the supply guarantees. This availability must be promoted through incentives in the form of contributions and/or financing at preferred rates provided for in a pertinent standard, also within the community context.

In the industrial sector, there are compartments, such as the cement industry, which represent an ideal market for coal because of the fact that the ash (and the sulfur) do not constitute a negative byproduct but are directly included in the product. Right after that comes the brick sector which however, because of the way it is broken up and the smaller dimensions of the factories, requires technical assistance for conversion of plants; but this is something which the bigger domestic operators in this sector are perfectly capable of taking care of.

Third, we consider the in-house producers of electric energy who have boiler plants capable of burning coal.

In addition to these big users, we have other industries, mostly small, extremely broken up, distributed over the entire national territory, for which we can anticipate a certain coal consumption.

On this basis, the potential of consumption in the industrial sector can be estimated as follows:

Table 3.1./3

	Millions of t/yr	
	1985	1990
Cement industry and related products	3.0	4.0
Industrial boilers	2.0	4.0
	5.0	8.0

Civilian Uses

The introduction of coal into civilian uses presents major difficulties not only because of the extreme way in which actual use is broken up, thus further aggravating distribution problems, but also because of the environmental problems connected with the use of coal in heavily populated areas. The latter are to a great extent relieved by the use of coke or "smokeless" agglomerates.

The big uses however are very well suited for the employment of coal.

In this respect, the government could promote a program for the conversion, to coal, of boilers in hospital centers, prisons, military installations, etc., employing technologies for the control of emissions into the environment, on an experimental or demonstration basis, using new burning technologies (fluidized-bed boilers).

The consumption potential by 1990 is 1 million t/year. Centralized heating for urban districts presents a noteworthy opportunity for the introduction of coal into civilian use. This is why it is difficult, under current conditions, to come up with development estimates although, without a strong policy of incentives, it is similarly difficult to expect any major improvements here over the next decade.

Production of Synthetic Fuels and Coal-Oil Mixtures

As we know, gaseous fuels, with a low, medium, or high calorific power, as well as liquid fuels, can be obtained from coal.

Gas with a low calorific power cannot be transported for economic reasons and is used at the gasifier's outlet. One of the most worthwhile utilization systems is integration with thermoelectric power plants using the combined gas-steam cycle; this technology--which promises high electrical energy conversion yields--is now being rapidly developed. Gas with medium calorific power (3,500-5,000 Kcal/m^3)--

whose technology is commercially ripe--can be transported economically over short distances (maximum 100 km) from the place of production; it therefore lends itself to uses as city gas or for industrial uses. Finally, the technique of producing gas with a high calorific power, which gives us a product (Sng) which can take the place of natural gas, has not yet reached industrial levels.

Regarding the production of liquids, technologies may varyaccording to two conversion processes: indirect liquefaction and direct liquefaction. In contrast to direct liquefaction, indirect liquefaction involves passage through an intermediate phase entailing the production of synthesis gases. The liquefaction technologies are in the process of development, with exception of the Fischer-Tropsch indirect liquefaction process used on an industrial scale in South Africa (although in a modified version).

On this basis it is difficult to establish targets for the production of synthetic fuels from imported coal; the fact remains the economic prospects of these technologies are rapidly developing in terms of time. During the next decade, there may be modest degrees of utilization for private users or for demonstration purposes.

Regarding coal from Sulcis, on the other hand, the ENI--because of its poor quality --is working on a project which, in case of positive results, will lead to the construction of a synthetic fuels production complex which could during the first phase take 2.8 million t/yr of raw coal, going up to as much as 4 million t/yr later. Worthwhile prospects are also opening up for the use of coal-oil mixtures. Studies now in progress and demonstration programs make us think that this technology can be developed positively. On this assumption, keeping in mind the necessary time frame, it is reasonable, in the current state of affairs, to set ourselves a coal consumption target, for the current decade, limited to 0.5-1 million t/yr. This target can be reviewed in the light of advances in research projects now under way, particularly those dealing with the possibility of employment in power plants operated with fuel oil.

Recapitulation of Consumption Situation

In the preceding paragraphs, we outlined the maximum potential consumption figures attainable during the next decade in the various sectors. The attainment of these figures presupposes not only a rather intensive effort but also complete success of all actions, something which cannot be considered easily achievable in all sectors and especially in those where there is a broad plurality of operators and where the use of coal depends on the favorable outcome of experiments still under way.

This is why the Plan, for the year 1990, has set itself an overall goal less than the sum of the maximum potentials of the individual employment sectors and this is why it has established the objectives for each of them in the form of value intervals whose upper extreme coincides with the potentials indicated earlier and within which the effective values will turn out according to the degree of success that it will be possible to achieve.

These intervals--whose range is more or less broad because of the greater or lesser uncertainties under current conditions--are shown in Table 3.1.4, covering the years 1985 to 1990, where we only show the overall consumption target for those 2 years, amounting to 26 and 55 million t, respectively.

Table 3.1./4. Imported Coal Consumption Targets in Italy as of 1985 and 1990 (*)

	1985 (10^6/yr)	1990 (10^6 t/yr)
(A) Boiler coal	12.7-15.0	36.6-48.0
ENEL power plants	8.0-9.0	34.0-38.0
Industrial uses	3.0-5.0	5.0-8.0
Civilian uses	0.5	0.5-1.0
Coal-oil	0.2-0.5	0.5-1.0
(B) Coking coal	13.0	13.0-14.0
Total	26	55

(*) Regarding domestic [in-house] production, we anticipate a Sulcis coal consumption of 2.8 million t/yr which can be raised to 4 million t/yr.

These targets call for approximately doubling the current coal consumption during the first 5-year period and a further doubling during the next one.

Concerning factors which will be involved in the achievement of this development, which constitutes one of the most important components of the Plan, it is necessary to recall some considerations of a general nature on which the actions outlined below are based.

As indicated in Chapter I, the current annual world coal output is about 2.6 million t [as published] and the most recent estimates indicated that, by the end of the century, the figure might go up to 5-6 billion t without dipping very much into existing reserves.

Many countries, some of which are politically stable and industrially developed (the United States, Canada, Australia) as a matter of fact have extensive programs for the development of their resources, also aimed at exports.

The availability of the relatively modest additional quantities of coal provided for under the Plan--12 million t for 1985 and another 29 millions for 1990--should thus be guaranteed, provided an active policy is developed, a policy which has already been launched and which involves long-term contracts and participation in mining activities in the exporting countries.

On the other hand, most of the coal is now consumed in production regions and only 5 percent approximately are exported over long distances (in other words, excluding trade within the EEC, the CEMA, and the United States and Canada); to move the additional quantities intended for export to areas with shortages, especially in Europe and Japan, it will therefore be necessary considerably to boost the current infrastructures and to create new ones, both at the origin and at the end of the line. To solve this problem, important initiatives--whose implementation however will take time--are already in progress or have been announced. It is therefore necessary, also on the level of diplomatic relations, to follow up on those under way abroad and to carry out those required in Italy by the necessary deadline, above all in terms of port and railroad handling equipment. This however does not rule out the possibility that the current bottlenecks might continue for a short period of time particularly in ports on the east coast of the United States.

But the noteworthy increase in Italy's coal consumption capacity will above all demand a very strong commitment to build, by the required deadlines, the utilization plants and the pertinent logistic infrastructure facilities and at the same time it will be necessary to guarantee environmental protection.

The success of actions in this field demands not only a technical and organizational effort on the part of all interested operators--which reveals noteworthy dimensions that are however compatible with the country's technological and economic resources --but also the full cooperation of all of the central and local authorities.

We are talking here particularly about the coal-powered thermoelectric power plants whose contribution will take up the preponderant portion of the increased consumption and will therefore be decisive; an essential preprequisite for the attainment of the Plan's objective therefore is the reduction, to a minimum, of the time required for site selection, construction, and start-up of these power plants.

3.1.4. Supply Strategies

Domestic Resources

In addition to the lignite deposits currently being worked by the ENEL and some marginal resources of scant industrial interests, the only Italian solid mineral fuel source is represented by the Sulcis basin whose exploitation has recently been started on new foundations by the Carbosulcis Company (SAMIM-ENI--Sardinian Mining Agency); it has already conducted prospecting in the northern portion of the current mining concession which however does not cover the entire deposit.

In the southern part, which is practically unexplored, prospecting work will start by the end of this year.

Economically recoverable reserves have been identified in the northern part and they come to 57 million t; it is anticipated that mining as such will start in 1981; at full speed, this will result in an estimated output of 2.8 million t/yr of raw coal. This production level can be doubled if--on the basis of favorable results from prospecting in the southern section--a second mine can be opened up which could follow the first one after only 2 years.

Sulcis coal is poor coal with a high ash and sulfur content. These features, which render it useless for burning in large quantities, without desulfuration, as well as the suitability of giving the coal the greatest possible added value, have persuaded ENI to undertake studies on new utilization alternatives, such as the production of synthesis gas from coal and the conversion of gas into methanol and possibly the conversion of the latter into gasoline.

These solutions would contribute to the maximum utilization of the mine because they would solve the market problem. ENI is preparing a project in this respect.

Supplies from Abroad

For the next several years, we can look forward to a great increase in coal use worldwide.

Coal is available in abundance but one must go looking for it and one must make it available by using tremendous capital investments, equipment, and manpower (the opening of a mine and its active commissioning require a period of 5-6 years).

On the other hand, many importers will turn up on the market. These conditions, as well as the previously mentioned restrictions, which constitute a burden on the worldwide coal system, must not deceive us as to permanent ease of location and availability of imported coal.

In the light of a situation such as this one, it is necessary--in order to meet the future needs of the Italian market--to contact the producers and the sellers with the right kind of "supply strategy" built around two decisive factors: reliability and price. These two objectives can be achieved through long-term purchasing contracts with the most qualified producers and sellers, with prospecting and direct production, with stockholder participation in the mines, and with maximum differentiation of geopolitical supply areas.

It is evident that such a policy cannot be pursued without the contribution of public entrepreneurs who would have to operate in consonance with this objective which is of the utmost national concern.

ENI must step up its efforts in mining activities abroad with the purpose of obtaining a large volume of available coal from its own production for the Italian market.

On account of its own coal needs, ENEL will continue its supply policy mostly through long-term contracts to be worked out directly with the coal producers.

On a priority basis but not exclusively, ENI will channel the available coal, coming from its own industrial initiatives, to the ENEL; on a priority basis, the latter will guarantee the withdrawal of these available volumes within the framework of its own technical and time requirements, as determined within the study group set up for the purpose of drafting the programs for the needs of the ENEL in medium-range and long-range terms, so that the ENI might arrange for and implement the investments necessary for covering a growing share of this need which, by way of guidance, so far would come to about 50 percent.

Sales terms and conditions will be in line with those of the international market for comparable supplies.

A joint committee will be established between the two agencies to compare and coordinate the pertinent programs and policies within the context of the above-mentioned lines of coordination.

ENI will also participate in meeting the domestic coal demand (as such or in the form of derivatives) for industrial and civilian uses, both from its own mining initiatives and through market purchase contracts.

Although the differing characteristics of metallurgical coal, as compared to boiler coal, restrict the area of possible collaboration with the ENI, the latter could nevertheless develop common mining initiatives aimed at the development of mixed deposits.

3.1.5. Infrastructure Needs

International Transportation

(A) Maritime Transportation

The ocean transportation component has a considerable effect on the cost of coal at the port of destination (averaging between 20 and 30 percent).

This component becomes particularly significant in the case of the supply of the Italian market from sources outside Europe which will constitute the majority of sources for future supply.

The ocean transportation cost per ton of coal goes down as the dimensions of the ship increase. We must however remember that, from the economic angle, it is necessary to use ships of appropriate capacity in relation to the quantities of coal to be carried, which from time to time are tied to the potential of the particular mine and the dimension of utilization.

From a study conducted by the IAEA ("The Long-Run Economics of the Ocean Transport of Coal," published 1978) it follows that the cost of long-distance transportation can be reduced about 40 percent if we use ships of 150,000 GRT in place of 60,000-GRT vessels.

According to the Wocol Report, most of the ocean shipments of coal during the eighties will be handled by ships of between 100,000 and 125,000 GRT, whereas ships of even larger size will be used in the nineties.

This will obviously happen in line with the adaptation of port infrastructure facilities in the exporting and importing countries. For this purpose it is noted that the exporting countries currently have only three coal loading ports which can accommodate vessels of more than 100,000 GRT.

To minimize the negative effects deriving from excessive dependence on the international charter market, Italy will have to increase its own fleet of large-size vessels. Right now, only the Finmare [Shipping Finance Corporation] Group--which meets more than 80 percent of the current requirement for the transportation of coal used in Italy--operates with 11 units larger than 100,000 GRT.

In order very roughtly to figure the available transportation capacity, we might assume some basic elements here:

(A) With reference to 1985:

Capacity of standard vessel: 80,000 GRT
Origins subdivided among South Africa, the United States, and Australia
Average duration of trip: 60 days
Annual transportation volume: 500,000 t/yr per ship
Required increase in transportation compared to 1980: 9 million t (26-17 million t [as published].

It thus follows that, to handle the anticipated coal supply volume as of 1985, it will be necessary, in addition to the existing fleet, to have about another 20 vessels of 50,000-80,000 GRT.

We recall that, according to a classical rule of international shipping, only one-third of the transportation volume is handled with company-owned vessels whereas the remainder is handled on the basis of medium-term and short-term charter contracts in equal portions (one-third and one-third).

It follows from this again that the transportation of additional quantities of coal, as provided for by 1985, given their volume, does not create any problems.

(B) With reference to 1990:

Ship's capacity: 120,000 GRT
Origins subdivided among South Africa, Australia, and the United States
Duration of average trip: 60 days
Annual transportation volume: 750,000 t/yr per ship
Necessary transportation increase compared to 1985: 29 million t.

This means that, in 1990, it will be necessary to run another approximately 40 ships for ocean transport.

Handling maritime transport requires special attention; here the contracts must be spelled out specifically from the moment of effective implementation of the above-mentioned investments in ships and they must be prearranged by assuming their continuous updating and constant checking and analysis of transportation costs.

Regarding these maritime transportation problems we must in any case recall the basic law for Italian maritime policy--Law No 684 of 20 December 1974--which assigns to the Finmare group the role of national maritime carrier for dry bulk cargo. As a matter of fact, the two participating companies--Almare and Sidermar--in 1979 carried two-thirds of the three most important dry bulk cargo items (iron mineral, coal, and cereals) whose traffic involved Italy; the share of shipments handled by these companies during that year came to 1/20 (5 percent) of the worldwide total.

Finmare furthermore has already started procedures for ordering the first four or five company-owned vessels from the shipyards to be procured by 1985 for coal transport.

B. Coal Pipeline

As part of a mixed Italian-Polish study group, established by both governments, ENI and IRI [Industrial Reconstruction Institute] conducted a technical feasibility study--whose economic aspects have not yet been completed--for the construction of a coal pipeline to transport Polish coal to Italy. A facility of this type--technically feasible--will be competitive as compared to conventional transportation systems for the resupply of the proper quantities of coal (10 million t/yr) and depends on certain economic studies that must yet be developed further in depth as far as the construction of a huge power plant located in the vicinity of the destination terminal. Among other things it will be necessary to study the advisability of shifting electrical energy rather than coal.

In the light of an opportune policy for the geographic diversification of supply sources, the construction of a coal pipeline is tied to the development of a big domestic market, so as to limit the coal supplied via pipe to a share that will not be significant as compared to the total heating coal imported by Italy.

The construction of a big power plant located at the outlet of the coal pipeline would make it possible directly, on the spot, to use the partly dehumidified coal dust, thus avoiding the use of expensive drying and briquetting phases necessary for the distribution of the product throughout national territory.

C. Receiving Facilities

A key point in the logistic system for an importing country, such as Italy, is the reception of coal at port installations capable of accommodating the big ships coming from the overseas producer countries.

The geographic diversification of supply sources in the future will include very distant producer countries (the United States, Canada, South Africa, Mozambique, Australia, China, India, Colombia, etc.). To reduce the maritime transportation costs, it will be necessary to use large-capacity ships. In this context, the adoption of coal terminals represents a solution considered advantageous for the following:

The reception of large-size vessels;
The possiiblity of establishing adequate stockpiles;
The possibility of guaranteeing shipments according to specifications through a mixture of coal from various origins;
Optimization of the use of the territory since the consumption centers can have smaller stockpiling areas.

From the terminals, shipment to the final destination can be handled either with smaller vessels for coastal customers or by other carriers (railroads, highways, waterways) for inland users.

The implementation of projects and facilities intended for receiving coal will require major investments for the country; the planning and completion of these projects must be viewed in the context of the best possible economic and financial conditions for the sake of the public interest.

The construction of coal terminals however does not do away with the problem of Italy's receiving facilities. On the one hand it will as a matter of fact be necessary to equip and strengthen some ports which are advantageously located with respect to the consumption centers, which could be served through the terminals; on the other hand, in some cases, the ENEL and ENI may find it necessary to build direct receiving facilities.

As part of the program for the construction of new coal-powered thermoelectric power plants, the ENEL in particular is planning to put up the proper port facilities in order to meet the needs of the plant near which they are located.

Regarding the possible construction of coal terminals, designed to meet some of the requirements of the ENEL and those of other industrial and civilian users, it is necessary to keep in mind that:

(1) The construction of a terminal (bulk transshipment) or a coal center takes between 4 and 5 years (depending very much on the place selected);

(2) Some countries which are big coal producers are not yet able to load vessels larger than 80,000-90,000 GRT;

(3) Vessels larger than 80,000-90,000 GRT would have to be routed mostly to the coal center.

The confirmation of a tendency toward the construction of big terminals comes from some big coal importing countries (Denmark, France, Holland, Japan, etc) which have built or which are planning to build coal centers that today represent the most ideal facilities for supplying huge quantities of coal with the help of large-capacity ocean-going vessels coming from faraway countries.

The establishment of one or more coal centers in Italy should take place in an area that is equidistant from the utilization centers, with the most favorable weather and orographic conditions also regarding the environment, with ample remaining space and safe and sufficiently deep bottoms and/or easy dredging; the first of these could be built at Gioia Tauro, the second one in the northern Adriatic, and the third one in the northern Tyrrhenian.

The main investments for the coal centers include several simultaneous unloading points, equipped for transshipment on barges or ships, unloading at the yard, reloading on lighters and ships, and carriers for distribution via land. The coal centers could be equipped for initial coal processing (screening, mixing, etc.). The wide-open spaces mentioned above would be used for the constitution of huge national coal reserves, properly moved around, something which is obviously important in case of an interruption in the flow of supplies from one or more sources.

(D) Distribution

The need for installations furthermore involves the inland transportation sector for the ENEL power plants located in the hinterland and for industrial and civilian users scattered throughout national territory.

To meet these requirements, it will be necessary to put up the following:

Coastal Coal Dumps:

Coals transport will be handled by small and medium ships, some of which will unload the coal at coastal coal dumps in keeping with the distribution centers for new, smaller users situated inland.

Transport via Waterway

The use of the Po River and the connected canals, following some readjustment work, represents an interesting solution for the resupply of users located in the Po Plain. The adaptation of the waterways system in the Po Plain is furthermore in line with the more general need for improving the domestic transportation system.

Railroad Transport

On the basis of the location of the main consumption centers, it will be necessary to develop some sections of railroad and to procure specialized freight cars to carry coal.

Highway Transportation

The use of automotive vehicles for resupplying small users a short distance from the unmixing centers will in many cases be a necessary solution. In that case, the adoption of containers could reduce the environmental impact.

3.1.6. Environmental Problems

Problems of an environmental nature, tied to the various phases of the coal movement and utilization cycle, require particular attention also in relation to the population density in Italy.

The modern technologies however make available to us special plants and procedures which enable us to hold down the environmental effect of coal within certain limits which can be pushed down and which definitely can be held below the figures required by law.

We can therefore definitely think that, even a great increase in coal use in Italy, as resulting from the program estimates, will be entirely compatible with the requirements regarding the environment.

The problems connected with this will be a subject of examination in the section entitled "Environmental Protection."

3.1.7. New Technologies

Research is in progress in many countries for the development of new technologies or the improvement of existing ones in order to expand the coal penetration sectors. Efforts are aimed primarily at increasing the yield and flexibility of carbon burning by increasing the range of coal that can be used in the boilers and by reducing the environmental impact.

One of the most interesting among these technologies is fluidized-bed burning for which experimental plants and atmospheric pressure have been put up so far. This technology still requires a by no means short period of experimentation in demonstration plants before it can be ready for the market. The advantages deriving from fluidized-bed combustion reside in the possibility of using low-quality coal, reducing the dimensions and therefore the costs of the plant, but above all reducing the contaminating emissions through the retention of SO_2 in the boiler and the reduced formation of nitrogen oxides.

Mixtures of coal dust with fuel oil (coal-oil) look particularly attractive because of the possibility of speeding up the substitution of oil with coal in current boilers using fuel oil.

The large-scale adoption of coal-oil mixtures in steam generators, originally intended for the use of fuel oil only, can be accomplished only after a period of sufficiently long experimentation, necessary to establish the percentage of coal in the mixtures which can be adopted without bringing about dangerous consequences regarding the most delicate parts of the steam generator.

In the field of new technologies for the use of coal, almost all industrialized countries have launched experimental initiatives and sometimes even preindustrial initiatives.

In this context, much attention has been devoted to the development of the technology for the production of liquid and gaseous fuels from coal. We can easily guess at the advantages due to the fact that we get products which cause considerably less pollution and where we have a much broader range of coal utilization as such. Particular interest is attached to low-power calorific gasification and there is a possibility of hitching it up with combined cycles based on gas turbine and steam turbine for the high-efficiency production of electrical energy.

In the field of coal conversion technologies, Italy is somewhat behind although this lag is not insurmountable when compared to the other industrialized countries.

It is therefore necessary not to lose a single opportunity of getting in on the international programs for coal liquefaction, some of which are still open to participation by other partners--but they will be open only for a little longer. In this respect, the industry must commit itself to the development of these technologies so as to assure Italy's participation in these development undertakings which have immediate industrial purposes.

At the same time it would be a good idea for the other agencies, particularly the CNR [National Research Council], to work out research programs in this sector which is so important strategically.

In this context it is necessary to launch demonstration projects in the fluidized-bed burning sector, in low-power calorific gasification connected with combined gas-steam cycles, as well as direct coal liquefaction. A priority effort must be devoted to pollution control technologies.

3.1.8. Analysis of Investments

The investment estimates given below represent general and rough evaluations which will require the proper in-depth study on the basis of definitive projects.

(A) Mining Activities

Investments can be divided into those which are necessary for supplies from abroad and those for the exploitation of domestic resources (Sulcis).

(a) Mining Activities Abroad

They pertain to investments in mines and in the installations necessary for shipping the products to Italy.

Assuming, in accord with the Wocol Study, an overall figure of $90 per ton of annual capacity produced, it follows that, over the next decade, it will be necessary to invest 1,200-1,500 billion lire for 15-20 million t/yr of coal. The country's foreign exchange commitment can be reduced obviously on the assumption that we can get into the international credit market.

(b) Mining Activities in Italy

They consist of the reactivation of the Sulcis Basin. According to initial studies, the investment has been estimated at about 170 billion lire per mining unit. Considering the opening of two mines, the total investment would be about 350 billion lire.

(B) Maritime Transport

The shipbuilding-time (about 1.5 years per unit) is much shorter when compared to the time needed to put up the other facilities; on the other hand, the identification of the ship necessary depends heavily on the way in which the entire coal project is handled. Right now, due to the lack of necessary statistics, we can come up only with an estimate purely by way of reference; it follows from this that the increase in the current fleet--to enable it to handle the requirements in 1990--should call for an expenditure of about 650 billion lire for the 20 vessels owned by Finmare or private operators.

It is furthermore estimated that the need for coastal vessels of 20,000 GRT will involve ten units for a total investment of 100 billion lire.

(C) Receiving Facilities

The total investments in this sector depend on the final configuration of the receiving system in Italy. An initial evaluation leads us to anticipate investments of about 600 billion lire for the three "coal centers."

(D) Distribution

The investments in this sector can be estimated on the order of 600 billion lire. They involve five coastal dumps, for the share of coal for transportation via water, as well as the adaptation of the fixed and mobile railroad facilities and highway transportation equipment.

(E) Thermoelectric Power Plants

Investments for the conversion of existing power plants and the construction of new ones using coal have been estimated about 7.8 trillion lire (at 1980 Italian lire) for the decade of 1981-1990, including 280 billion lire for the 3-year period of 1981-1983.

(F) Synthetic Fuels and Coal-Oils

We estimate an investment of about 1 trillion lire for the construction of coal conversion plants in Italy (gasification plants and plants for the preparation of coal-oil mixtures), to be started within the first 5-year period and a comparable figure for the next 5-year term.

For participation in conversion projects abroad, we estimate initial investments on the order of 200 billion lire, unless we reconsider the question in the light of business opportunities that might take shape in time.

(G) Research and Development and Demonstration Plants

The lines of research which the PNRE must pursue should be consistent with what we said earlier in Paragraph 3.1.7., regarding new technologies. In particular, it will be necessary to provide for the construction of demonstration plants that will display the new technologies for coal conversion.

3.1.9. Actions over the Next 3 Years

The implementation of the projects for the development of consumption calls for a series of steps which must be taken rather soon.

In the sector of thermoelectric power plants, it will be necessary, on the one hand, to increase consumption in existing coal-powered power plants and, on the other hand, to complete the planned conversions of power plants currently supplied with fuel oil.

At the same time it will be necessary to pick the sites at which the new coal-powered power plants are to be built.

Regarding industrial and civilian uses, it is necessary to provide the proper promotional instruments (low-interest financing, program for the conversion of boilers in public complexes, etc.) so as to permit the start of coal consumption in this sector.

Supplies

The public operators, especially the ENEL and the ENI, will have to make every effort along the lines spelled out above to guarantee the reliability and continuity of supplies to the country under the best possible technical and economic conditions, according to the operational outlines indicated above.

The Sulcis coal resources must rapidly be exploited, starting actual mining operations as planned during the first phase of the basin improvement project.

Infrastructure Facilities

It will be necessary to complete the strengthening of the existing final coal destination ports and to make a general feasibility study concerning the first coal terminal.

It is necessary to place orders for the conversion and construction of new ocean-going vessels of 100,000-125,000 GRT or smaller vessels.

Coal--Recapitulation of Investments (Billions of 1980 Lire)

		1981÷83	1984÷90	1981÷90
1)	*Attività mineraria*	*500*	*1.350*	*1.850*
2)	— Italia	100	250	350
3)	— Estero	400	1.100	1.500
4)	*Trasporti marittimi*	*100*	*650*	*750*
5)	— Navi oceaniche	100	550	650
6)	— Navi costiere	—	100	100
7)	*Infrastrutture di ricezione*	*200*	*400*	*600*
8)	*Distribuzione*	*300*	*300*	*600*
9)	*Centrali termoelettriche*	*280*	*7.520*	*7.800*
10)	*Combustibili sintetici e coal-oil*	*200*	*1.000*	*1.200* *
2)	— Italia	180	820	1.000
3)	— Estero	20	180	200
11)	Totale	1.580	11.220	12.800

(*) Previsioni limitate al primo quinquennio.

Key: 1--Mining activities; 2--Italy; 3--Abroad; 4--Maritime transportation; 5--Ocean-going vessels; 6--Coastal vessels; 7--Receiving facilities; 8--Distribution; 9--Thermoelectric power plants; 10--Synthetic fuels and coal-oil; 11--Total; (*) Estimates limited to the first 5-year term.

3.2. Natural Gas

3.2.1. Current Situation

Natural gas consumption in Italy in 1979 came to 27.6 billion cubic meters and about 28 billion cubic meters are anticipated for 1980. These quantities cover more than 15 percent of the nation's energy consumption.

In 1979, the breakdown among the uses was as follows:

Industrial uses	12.3	Billions of cubic meters	44.6%
Civilian uses	10.2	"	36.9%
Thermoelectric uses	2.2	"	8.0%
Chemical uses	2.6	"	9.4%
Automotive transportation	0.3	"	1.1%
Total consumption	27.6		100%
Differences and losses	0.2		
Total available volume	27.8		

The available volume was subdivided in territorial terms to the extent of about 80 percent in the central and northern regions and the remainder went to the South.

The available volume was made up as follows:

		Billions of cubic meters	
Domestic output		13.1	47.1%
Imports			
Libya	2.1		
Holland	6.7		
USSR	5.9		
Total imports		14.7	52.9%

The demand for natural gas was therefore met from domestic production to the extent of less than one half.

The network of methane pipelines reached a total length of 15,000 km, including more than 1,000 km abroad, to build gas pipelines for imports from Holland and the Soviet Union.

Regarding Libyan gas, the Panigaglia regasification plant is in operation now; it will soon have to be adapted to the new situations deriving from new imports from Nigeria and the modifications introduced by the Libyans in their contract. With the major lines and the secondary networks under construction, the existing network guarantees the supply, transportation, and distribution of a large share of energy which is very much in demand.

To cope with the considerable modulation in the demand and to guarantee the necessary continuing flow of supplies to preferential users, plans have been made for further increases in existing storage areas and the construction of new storage areas in order considerably to increase the current peak capacity and the quantity of volumes that can be requested for a period of several months, either during the winter season or in case of a temporary reduction in available imports.

3.2.2. General Objectives

Natural gas must play an ever more decisive role in meeting Italy's energy needs.

One of the main reasons springs from the advisability of diversifying the energy supply sources as much as possible; due to the rigidity of the transportation facilities, which also from the economic and financial viewpoint involve both of the contracting countries, the long-term natural gas contracts present greater reliability in terms of a continuing flow of supplies, as compared to petroleum.

Natural gas consumption in Italy will therefore go up as in the rest of the world. We furthermore have a series of objective reasons which prevent us from increasing the natural gas share beyond certain limits, in relation to the differing conditions of availability and competitiveness with alternate fuels. In some countries as a matter of fact it is primarily earmarked for civilian and industrial consumption involving a high level of technology, minimizing the share destined for supplies that can be interrupted, a share which normally is used to meet seasonal demands.

In those countries, the penetration of gas is definitely less than 10 percent.

In countries, on the other hand, with large domestic resources, gas is destined for a broader market which includes not only the above-mentioned consumption but also consumption involving a lower technological level, where gas offers advantages that are less noticeable when compared to alternate fuels. In those countries, large quantities are destined for consumption in the production of steam and electric energy.

In these cases, we now can see coverage in excess of 20 percent, such as in the United States and the USSR (25 percent) and some even more than 50 percent, as in the particular case of Holland which however for the time being--in view of the current policy revision--will in the future drop to 30 percent.

The policy pursued so far in Italy has been aimed at a half-way penetration of natural gas with figures which, in recent years, have fluctuated around 14-15 percent, in line with the average of the other EEC countries, excluding Holland.

Regarding the next several years, we believe that we can continue with this model, assuming a maximum natural gas coverage equal to 20 percent. This objective involves timely planning of natural gas distribution over the entire national territory.

This planning has been made possible so far through coordinated management capable of solving the big technical-economic problems as well as the political problems connected with long-term supply. Coordinated management provides for the best possible interconnection of the methane pipeline network, in order to link the various points of arrival of imports, the production deposits, and the storage facilities and in order, finally, to be able to be flexible in coping with any temporary reductions in gas availability.

3.2.3. Actions To Be Undertaken during the Decade

The Algeria-Italy gas pipeline is now under construction; it will facilitate imports at a rate of 12 billion cubic meters per year by 1985, with the arrival of the first quantities by 1981. With this new import transaction, the annual gas volume available for consumption by 1985 will be on the order of 35 billion cubic meters per year. With the purchase of another 9-10 billion cubic meters per year from imports and assuming that domestic production is held down for conservation purposes, we would, by 1990, arrive at an assumption of 43-45 billion cubic meters per year, broken down as follows:

	(Billions of cubic meters per year) 1985	1990
(a) Domestic production	7-8	7-8
(b) Contract imports		
Libya	3-2	3-2
Holland	6	6
USSR	7	7
Algeria	12	12
	28-27	28-27
(c) Other imports after 1985	--	9-10
Total imports	28-27	36-38
Total available volume	35	43-45

This gas volume will represent 18.5 percent of the national energy consumption figure and will be made up to the extent of about one-sixth of domestic production whose level has been planned lower than what it is now for safety reasons.

As a matter of fact, while the search for hydrocarbons in Italy has been conducted extensively and intensively over the entire territory and national off-shore sectors, with a growing financial commitment and with the use of ever more modern and sophisticated technologies, discoveries so far reveal that the drop in reserves due to production has on the average been made up. Further major discoveries do not appear probable and we therefore expect that we will not be able to continue to keep the residual reserves almost unchanged, above all if we continue at the production rates of the past several years.

It is therefore necessary rapidly to pass the new mining law which will make it possible to increase the probability of new discoveries along with an increase in economic and technical resources to be devoted to prospecting. It nevertheless appears necessary progressively to reduce the production levels to 7-8 billion cubic meters per year so as to constitute a strategic reserve which, in view of an ever more accentuated seasonal fluctuation, must also guarantee the availability of natural gas to meet energy needs under situations of temporary supply difficulties, either because of an international crisis on the market or because of more or less prolonged interruptions in supply contracts.

The establishment of these reserves, in other words, the reduced exploitation of the deposits that are in production, calls for a series of economic and financial steps in order to give the producing fields characteristics which will be in keeping with the particular service characterized by tremendous peak loads.

It is furthermore necessary to consider the legislative aspects which will emerge following a longer period of exploitation of deposits, when compared to the duration of the concessions provided under current legislation, particularly in regions with a special status for the purpose of utilizing concessions not provided for in current laws.

The development of gas consumption will therefore in the future involve growing recourse to imports, with a subsequent further increase in dependence on foreign gas supplies.

All of this applies if we assume that the current competitiveness of natural gas with alternate fuels and the purchasing prices as such can be maintained for the future.

Right now some producer countries--which have also found support among the OPEC--are trying to push through a big price rise, trying to get FOB parity from the producer country for each calorie of gas and each calorie of crude oil. The implementation of such an idea--which does not take into account the diversity of the user markets and the greater costs of transportation and distribution--could bring about a redimensioning of the penetration capacity of gas and could necessitate a revision of programs.

In line with the available volume and the desire on the part of the producer countries to export, we can identify the following areas from which gas could come to Italy.

North Africa: particularly Algeria and Libya (the latter on land and especially in off-shore areas) have significant reserves and furthermore are favorably located geographically with respect to Italy.

The USSR: above all in the light of recent news of projects under study to export gas to Europe coming from areas in Western Siberia.

North Sea: this area can turn out to be economically feasible in long-range terms for the Italian market since it would be possible to use the existing gas pipelines that carry gas to Italy from Holland and since, toward the end of the eighties, there may well be a decline in volumes transported as compared to those carried right now.

Gulf of Guinea: in particular from Nigeria, above all in relation to preliminary agreements worked out by a consortium or European importers, including also SNAM [National Gas Pipeline Company].

In the light of the above, we believe, as we said before, that about 45 billion cubic meters per year should be available for the Italian market oy the nineties, amounting to about 37-38 million tep.

At the start of the nineties, the import contracts with Holland and Libya are scheduled to run out and it will therefore be necessary to obtain further imports through greater purchasing of potential available volumes from the above-mentioned areas and also by getting into new areas, such as those in the Middle East.

Even if we neglect the time needed for the study and negotiating phases, the implementation of an importing project takes considerable amounts of time. As a matter of fact, on the basis of past experience with imports stipulated so far, it takes an average of 6-7 years between the finalization of a contract and its practical implementation.

It will consequently be necessary to undertake a series of actions already during this decade, also for those imports that are to be assumed in the nineties.

Studies and research projects will furthermore be developed with relation to alternate fuels to be distributed through pipelines (coal gasification).

3.2.4. Technological, Environmental, and Employment Aspects

In the light of the ever greater value of energy, actions are now underway in order to keep energy down in the existing production cycles and to look for new technologies that will increase efficiency in the energy transformation of the production cycles. The use of natural gas, more than other fuels, facilitates the optimization of the combustion and regulation phase and the control of plants, with corresponding energy savings which, in some sectors, can also attain figures of 30 percent.

Furthermore, the absence of polluting components in the products deriving from natural gas combustion makes this fuel a valid means for reducing atmospheric contamination without having to resort to expensive processing.

As for the employment aspects connected with the gas industry, it is tied directly and essentially to the implementation phase of these projects and indirectly to the operational phase, since the supply of methane to new areas is strictly tied to an estimate of the industrial development of the areas as such and in turn constitutes a favorable location factor in terms of further development in such areas.

3.2.5. Investments

The financial commitment, necessary to put up the structures for supplies from abroad and for distribution, will involve large quantities.

As for the 3-year terms of 1981-1983, investments are estimated, at current values, totalling 1.8 trillion lire, including 1.05 trillion for the completion of the Algeria-Italy gas pipeline. Of that amount, 750 billion lire will go to projects on Italian soil and 300 billion lire will be spent on the sections abroad. The development of the national transportation and distribution networks and the related projects will involve investments taking up the remaining 750 billion lire.

To these investments by the ENI we must add those from the communities, dealing with the construction of urban distribution networks in the South, assisted by Federal government contributions.

The cost of these projects, in medium-range terms, has been estimated at a round 1 trillion lire, of which 500 are earmarked for the three-year term under consideration.

During the successive years until 1990, we have estimated investments on the order of 3.5 trillion lire, including 1.5 trillion lire approximately in Italy and 2 trillion lire abroad, to implement the above-indicated supply and distribution program. In view of the considerable volume of investments to be earmarked for the supply and distribution of natural gas, it is necessary to come up with a firm and correct rate schedule for the use of this energy source, as compared to the other sources. First of all, it will be necessary to use gas for those purposes

which will make the most use of its qualities and where the use of gas will make it possible to replace more expensive fuels or to improve the yield (in industrial uses with high technology, in civilian cooking uses, utility water, minor heating, particularly autonomous heating, and in joint generation with internal combustion engines and gas turbines). Secondly, it will be necessary to maintain a balanced relationship on the international energy market between prices of individual sources, taking into account the specific advantages.

Consequently, the price of gas will have to become a decisive element in order to achieve its balanced development.

The adaptation of gas sales prices on the domestic market to what they are on the international market will be necessary, not only to achieve the above-mentioned objectives but also to cope with the development of gas supply costs as such.

Still looking at the energy planning sector, the establishment of strategic reserves, which we stressed earlier and which will involve a series of technical and financial steps for proper implementation, will furthermore have to be the subject of timely legislative action and special financial transactions.

These steps are necessary in order to recover the heavy expenditures deriving both from the cost of modifications and from the slowdown in the exploitation of deposits.

3.2.6. Methane for the South

Methane for the South assumes particular importance in the natural gas project for the next decade. The availability of significant quantities of natural gas provided for the South could be an incentive for the settlement of industrial establishments and for the conversion to methane of those now existing there, and this could also represent an opportunity for the development of city networks in the civilian sector.

If these program points are to be translated into reality, we will need a major commitment and considerable investments. The most important aspect of this commitment is to get the money necessary for the construction of these projects.

In this respect, the government has allocated 605 billion lire for the 3-year period of 1980-1982 as a contribution to the promotion of the implementation of urban and territorial methane distribution networks. This allocation will be broken down as follows:

(a) Granting the communities and their consortiums contributions to the capital account within a limit of 30 percent of the estimated spending for projects involved;

(b) Granting the communities and their consortiums 10-year loans at low annual rates of 3 percent for the last 30 percent of the spending volume;

(c) Granting the ENI contributions to the capital account, with a maximum limit of 40 percent of estimated spending, for the construction of secondary pipelines for the development of areas involved, entailing a total amount of 100 billion lire.

The government has furthermore decided that, in the southern areas, gas for civilian uses is to be exempt from consumption taxes in order to provide an incentive for the use of gas with a view to the efficient utilization of energy resources. Future availabilities of methane earmarked for the South for civilian use will make it possible to meet the energy needs of about 3 million families around the middle of the eighties.

Table 3.2./1. Natural Gas--Recapitulation of Investments (Billions of 1980 Lire)

		1981-83	1984-90	1981-90
1)	*In Italia*			
2)	— Dorsale per gas algerino	750	—	750
3)	— Sviluppo rete metanodotti	300	1.000	1.300
4)	— Reti di distribuzione urbana	400	500	900
5)	— Potenziamenti stoccaggi	50	—	50
6)	— Centrali turbogas	180	100	280
7)	*All'estero*			
8)	— Gasdotto Algeria-Italia	300	—	300
9)	— Infrastrutture per il potenziamento delle importazioni	—	2.000	2.000
10)	Totale	1.980	3.600	5.580

Nota. Non sono compresi gli investimenti minerari per la messa in coltivazione di nuovi giacimenti, già inclusi nella attività di produzione di idrocarburi.

Key: 1--In Italy; 2--Trunk line for Algerian gas; 3--Development of methane pipeline network; 4--Urban distribution networks; 5--Increased storage facilities; 6--Turbogas power plants; 7--Abroad; 8--Algeria-Italy gas pipeline; 9--Infrastructure facilities to increase imports; 10--Total. Note: this does not include mining investments for the opening up of new deposits, already included in the hydrocarbons production activities.

[12 Dec 80, pp 1083-1097]

[Text] Nuclear Sector, Oil

In this issue we continue the publication of the National Energy Plan dealing with the nuclear and petroleum sectors.

3.3. Nuclear

3.3.1. Current Situation

There are four nuclear electric power plants installed in Italy; three of them--Latina, Garigliano and Trino Vercellese, with a total capacity of about 600 MTU--belong to the first generation and became operational at the beginning of the sixties.

The fourth power plant, the one at Caorso, is of more recent design and began to produce energy in 1979, concurrently with the acceptance phase.

During 1979, these four power plants contributed 0.4 percent to meeting the country's energy needs (as against 2.7 percent in 1978) and they contributed 1.4 percent to meeting the total electric power output target (as against 2.5 percent in 1978).

The planned shutdowns, which are necessary for the modernization of the safety systems at the Trino and Garigliano power plants, contributed to the reduction in the contribution of the above-mentioned power plants as compared to the theoretically obtainable output. The Garigliano plant has suffered damage due to corrosion in a secondary steam generator; efforts are underway to get it back into operation. In 1979, furthermore, the nuclear testing program at the Caorso power plant was slowed down considerably above all due to the requirement for the perfection of hydrogen measurement instruments in the primary reactor vessel. At the beginning of 1980, the Caorso power plant passed its nuclear acceptance tests and reached standard thermal capacity corresponding to an electrical capacity of 875 Mw net (guaranteed figure 840 MTU).

Table 3.3./1 shows the contributions from the nuclear source to meeting energy needs in some Western countries in 1979, compared to the 1985 estimates which are certainly realistic but which are based on power plants currently in service or in an advanced stage of construction.

Table 3.3./1. Spread of Nuclear Energy Use (Percentage Figures)

	1) Quota consumi energetici totali		2) Quota produzione energia elettrica	
	1979	1985	1979	1985
3) Svizzera	9,8	15,0	24,7	30,0
4) Svezia	8,1	18,0	26,0	41,0
5) Francia	5,2	16,4	16,4	58,0
6) Belgio	4,7	12,6	21,7	52,0
7) Giappone	3,9	6,7	10,0	24,0
8) Regno Unito	3,7	5,3	11,9	18,0
9) U.S.A.	3,8	6,1	11,9	21,0
10) Spagna	2,2	12,1	6,7	35,0
11) Italia	0,4	1,1	1,4	4,0

Key: 1--Total energy consumption shares; 2--Electric energy production share; 3--Switzerland; 4--Sweden; 5--France; 6--Belgium; 7--Japan; 8--United Kingdom; 9--United States; 10--Spain; 11--Italy.

By 1985 the Italian situation will not be different from the current [illegible] because the difficulties encountered in the implementation of the power plant construction program are such that the only new contribution, starting in 1983, will come from the Italian share equivalent to 400 MTU from the Superphenix-1 fast [breeder] power plant, built in France as part of a cooperative program between France, Italy, and Germany.

The parliamentary motion of 5 October 1977 had committed the government to promote balanced and controlled recourse to nuclear energy through the construction of four units already contracted out, the start of procedures and qualification competitions for the construction of another four units, and the possibility of an option for another four units on the basis of the development of the electric power demand, with a government commitment to consult parliament at the moment the option is exercised.

This program, spelled out by the CIPE in December 1977, is still in a rather rudimentary stage, essentially due to the serious difficulties encountered during the plant site selection phase.

Looking at the four 1,000-MTU units already contracted out, difficulties were encountered in the case of two of them which were to be located in Molise and this has completely stopped the site selection procedure.

For the other two units, to be built at Montalto di Castro, according to ordinances put out by the mayor, charging a need for checking into the geological characteristics of the site, work has been suspended and it has not been possible to get the situation moving again even though the ENEL appealed to the TAR [Regional Administrative Tribunal] which did not invalidate the mayor's ordinance. Considering the importance assumed by this case in national public opinion, the industry minister directed the CNEN to pursue the seismotectonic studies of the area involved--also by using a committee of highly competent experts--in order to check into the validity of antiseismic planning prescribed for the power plant.

Following the appeals filed by the ENEL against the ruling by the TAR, the Council of State of 4 July 1980 limited the validity of the mayor's ordinance stopping the work until the completion of the investigations demanded from the commission appointed by the CNEN. The Council of State also confirmed the competence of the appropriate nuclear safety agencies to judge the results of the investigations that had been ordered and it directed that this function can under no circumstances be performed by the mayor.

On 6 October 1980, the commission established by the CNEN drafted its opinion and, thereafter, the Industry Ministry on 23 October 1980 invited the ENEL to resume the work which had been suspended.

Among the circumstances which helped aggravate the delay in the new power plant construction program, we must mention the highly emotional response triggered by the incident at the American power plant in Harrisburg in March 1978; this incident had repercussions in Italy, launching a broad debate on the problem of nuclear power plant safety.

Considering this situation, the government, in line with the requests from political and labor union forces, organized the National Conference on Nuclear Safety which was held in Venice in January 1980, in order to discuss the problem of safety in nuclear power plants in Italy--in a public confrontation with the participation of representatives of all positions--on the basis of a thorough report drafted by a consultative commission of experts appointed by the industry minister for this particular purpose.

Both the report drafted by the commission, and the debate on its presentation and on the numerous contributions, in the course of the conference, made it possible, on the basis of reliable information, to confirm above all the adequacy of safety standards and procedures in Italy. But the conference brought out the need--in relation to the implementation of a major nuclear program--for strengthening the country's basic structures which must handle matters of investigation and action out in the field so as to enable them to cope with the demands of a modern industrial society. The efficiency of these structures as a matter of fact determines the development of important industrial sectors, not just the nuclear sector.

At the end of the conference, the government--reaffirming the basic guidelines in the matter of energy policy--confirmed the requirement for using nuclear sources, thus, in a legislative setting, committing itself to tackling problems pertaining to the following: the separation of safety and control functions from industrial promotion functions; territory-wide planning; the need for balancing local interests and the demand of the national community. The administration furthermore pledged to step up the dissemination of information on plant safety and, through suitable mechanisms, to review and update the emergency plans.

A further contribution toward overcoming the current state of uncertainty regarding the placement of nuclear power plants is represented by compliance with the provisions which Article 23 of Law No 393 imposes upon the CNEN regarding the drafting of the "site map." The report submitted by the CNEN identifies more than 50 areas with favorable site location characteristics dealing particularly with the population, geological, and earthquake aspects as well as considerations of technical feasibility and ecology.

At the 28 February 1980 meeting, the interregional consultative commission, attacked to the CIPE, reviewed the study presented by the CNEN for the preparation of the "site map" and invited the CNEN and ENEL to go into an in-depth examination investigation--within their respective areas of competence--of problems dealing with the areas identified so as to proceed to a further selection and to start the necessary technical soil studies. For this purpose, the commission considered it advisable, also in relation to the social-economic aspects and the regional development programs, to establish mixed committees including the regions, the ENEL, and the CNEN, for each region and for groups of regions with similar interests.

The efforts immediately launched for the establishment of these mixed committees were rather slow in taking shape also because of the coincidence in terms of time with the renewal of the regional administrations. The regions of Basilicata, Friuli-Venezia Giulia, Lombardy, Puglia and Sardinia have already declared their readiness to establish mixed committees.

A positive contribution to the possibility of efficiently starting the new undertakings is represented by the agreement recently arrived at among public and private groups in the electrotechnical industry sector. By restoring a situation of excessive fragmentation, it nas been possible to create a single nuclear plant center with a public majority, with a unitary structure on the system level--whose leader is Finmeccanica [Mechanical Engineering Finance Corporation]--in the field of boiling-water reactors and pressurized-water reactors. This industrial combine furthermore helps overcome the lengthy debate which took place on the advisability of having Italy adopt a prevelant reactor line in relation to the need for not only

speeding up, in Italy, the construction of standardized nuclear plants with high reliability and operating safety, but also for improving the utilization of the production structures.

The materialization of the industrial combine permits the more efficient use of resources represented by the capacities, both on the planning level and on the manufacturing level, constructed in the course of more than a decade of activity. These resources, which have been checked out on the international level, are in danger of being scattered if the stagnation in specific projects were to continue; the function performed by the CNEN programs in terms of providing an incentive and support for industrial promotion and the construction of experimental reactors would lose its entire effectiveness if there were no firm decisions really to get this sector moving again. In this deadlock situation, a specific opportunity for technological and management upgrading was represented by the participation of Italian industry, both systems and components, in the construction of the Superphenix fast power plant in France.

In the fuel cycle sector likewise, the rationalization process was completed with the creation of a single center identified in the Nuclear AGIP [National Italian Oil Company] of the ENI Group so that the nation's industry is now able to operate although there were some shortcomings in specific accomplishment as compared to the announced program for the installation of power plants which had been properly checked out and tested. As a matter of fact, assuming the effective development of the nuclear electric programs, initiatives of industrial magnitudes were undertaken during the up-line cycle in the utilization of fuel in the reactor (supply of natural uranium, enrichment of uranium and manufacturing of nuclear fuel), which are indispensable in starting up and running the planned reactors. The delay in the implementation of the nuclear electric program caused a situation of surplus capacity which resulted in major financial burdens which were shouldered completely by the operators. Particularly significant are the expenditures connected with the actions launched at the time to obtain uranium enrichment services (service contracts in the United States and the USSR and, above all, participation in the EURODIF [European Difussion Agency] International Company with headquarters in France). In paticular, the unit of magnitude involved in participation in EURODIF, according to commitments undertaken in 1974, would have entailed a capital commitment of about 5.5 trillion lire (under the economic conditions prevailing in June 1980); to reduce these expenditures, renegotiations were conducted with the French partners regarding the Italian participation share (held by Nuclear AGIP and CNEN) in EURODIF, reducing it from 25 percent to 16.25 percent.

The availability of enrichment services, which springs from the current stockholder participation, permits the recovery of an annual amount of about 350 t of enriched uranium; this quantity constitutes a considerable resource in the entire country (equivalent to about 25 million t of petroleum each year) which must be utilized and specifically converted into really available energy through the construction of nuclear power plants.

The nuclear fuel manufacturing plants are also already available (FN [Nuclear Manufacturing] Company of Nuclear AGIP at Bosco Marengo near Alessandria) and they have been employed to a considerable extent so far.

For the other activities involved in the cycle, down-line from the utilization of the fuels in the reactors, such as reprocessing and treatment of radioactive waste, pending the materialization of a domestic demand with significant dimensions, the plans and the actual construction of industrial facilities have been postponed; for short-range and medium-range efforts, a decision was made to provide adequate storage capacities for irradiated fuel. Concerning the treatment of radioactive waste, the time frame connected with the problem is rather drawn-out so as to permit the further perfection of already available technical solutions in order to identify those which are generally more suitable.

The idea of assigning to nuclear energy a by no means secondary role in reducing electric energy generation from petroleum and, consequently, the idea of making a maximum possible effort in technical and organizational terms for the construction of power plants of a type that has been properly proven--these are among the priority objectives of the present plan and they are quite in line with the Fourth Five-Year Plan of the CNEN for 1980-1984 which was approved by the CIPE in April 1980. The research, development, and industrial promotion program guidelines of the CNEN in the nuclear sector call for the attainment of ever better plant safety conditions and health protection for the population; the activity connected with the promotion of the construction capacities of domestic industry both regarding the national program and the foreign market; the boosting, in collaboration with industry of activities concerning the fuel cycle, especially reprocessing of irradiated fuels and the processing of slag; the continuation of research and experimentation in the area of international cooperation in order to keep the fast breeder reactor option open.

3.3.2. General Objectives

The most representative and authoritative international gatherings (OECD, EEC, Tokyo and Venice summits) confirmed the need and urgency of utilizing nuclear energy as one of the alternatives to dependence on petroleum, capable of making a major contribution in medium-range terms. This technology is today amply checked out and available under economic conditions which are definitely competitive also as compared to coal. At these meetings, Italy expressed a position in line with this direction which the Western countries agreed to pursue.

Specific initiatives were launched at the time in all of the major industrial countries--likewise accompanied by lengthy debates--which, as we said earlier, during the eighties will guarantee a noticeable contribution from nuclear energy.

The continuation of an increasingly serious deadlock situation in Italy could, also regarding electric energy production, force us to fall back on expensive sources and unreliable supplies whose high cost, reflected in national industry production costs, would bring about a loss of competitiveness in the goods produced.

The National Energy Plan therefore calls for significant use of nuclear energy with maximum guarantees regarding safety aspects.

In this regard we must realize that no industrial activity, particularly in the energy sector, is devoid of risks and that the attention devoted in nuclear technology to safety problems, through the adoption of criteria which have been refined with the passage of time, have no parallel in any other sectors. These considerations

are behind the decision to go into a major program for the construction of nuclear power plants, adopted--in the context of a growing information and involvement effort in dealing with public opinion--also by countries which have territorial and population conditions less favorable than those in Italy (for example, Japan).

The decision to use the nuclear source, in addition to motivations of an economic type, is of strategic significance in line with the objective of diversifying sources and obtaining reliable supplies. It is furthermore necessary to keep in mind that the development of the nuclear sector is a moving force for planning and manufacturing aspects involved in other important industrial sectors with an advanced technology.

As its target for 1990, the National Energy Plan proposes an output, from nuclear sources, amounting to at least 10 million tep. The attainment of this goal implies the commissioning, by 1990, of at least another 4 units of 1,000 Mw, each, in addition to the completion of the Montalto di Castro power plant. The Plan furthermore calls for the rapid start, during the decade, of the construction of other power plants whose commissioning will take place during the years after 1990 at such a rate that the nuclear effort will lose its episodic character which it has had so far in Italy.

The operational capacities of the Italian industrial system are now already quite in line with this objective and the actions provided for under the plan will make it possible rapidly to adjust the action capacities of the other agencies operating in the nuclear sector. The available structures represent a valid and autonomous resource implemented through vast investments which have already been made and where the failure to utilize them would not only be unjustified waste but would be in open contradiction to another general objective of the strategy adopted here, an objective which calls for a maximum commitment of domestic resources.

The nuclear electric sector is one of the few sectors, among those with advanced technology, which views the nation's plant and manufacturing industry as not being in any way behind in the international context.

The construction of the Caorso power plant offered an opportunity for significant improvement. The fact is that the technology adopted, although of foreign origin, has rather modest relevance in economic terms; the fraction of spending abroad (substantially for royalties and for the acquisition of some components which it does not appear to be economically feasible to make in Italy) as a matter of fact has been estimated at less than 20 percent and may drop to values near 10 percent. On the technological level, we have also demonstrated the capacity of Italian industry to assimilate foreign licenses and thus to achieve a high degree of autonomy.

The use of a technology of common origin by the majority of the industralized countries guarantees a high degree of integration (particularly in Western Europe) relative to a sector with a high technical level which, on the one part, gives us assurances as to the degree of maturity of the technologies and the potential in coping with any possible unforeseen specific difficulties of an engineering nature; on the other hand--in important aspects--it facilitates significant economies of scale and the availability of an impressive volume information relating to standardized operations.

We know that the energy potential deriving from the nuclear source has been greatly increased (by a factor of more than 50 as compared to use in reactors of the proven type) by the employment of fast neutron breeder reactors.

Almost all of the major industrialized countries are committed to this sector on the research and development level and some countries already have projects going on the level of high-capacity power plants (France in collaboration with Italy and Germany at the Superphenix power plant and the USSR with the BN-600 power plant), while the United States, after a period of uncertainty, decided to build a 600-MTU power plant.

Right now, Italy cannot make a decision as to the commercial use of this type of reactors for objective reasons. That decision as a matter of fact can be made only after we have:

Availability of the necessary quantity fuel irradiated in proven reactors and the pertinent reprocessing services (on a national or international basis) to extract from that fuel the plutonium necessary for the first nuclear charges of the fast breeder reactors;

A mastery, by the entire Italian system (industry, electric operators, authorization and control body) of the fast breeder reactor technology with special emphasis on aspects connected with safety.

To keep this option open, it is necessary to continue research and experimentation with such reactors and this was clearly indicated in the parliamentary resolution of October 1977.

The moment the two above-mentioned requirements have been met, a decision can be made also taking into account the choices made in this respect by other countries.

Nuclear Power Plant Production Cost Structure

The cost of producing each kilowatt hour produced by nuclear power plants, by coal-powered power plants, and by power plants running on fuel oil, are compared in Table 3.3./2.

Table 3.3./2. Cost of Kilowatt-Hour Production at Power Plant Output (1)

Cost Components	Type of power plant: Nuclear power plant with two groups of 1,000 MTU, each	Power plant with 4 groups of 640 MTU: Using fuel oil	Using coal
Capital expenditures	10.5	4.5	5.9
Dismantling	0.2	--	--
Operating and maintenance expenses	2.8	1.4	1.8
Fuel cost	7.3	41.5	18.9
Total	20.8	47.4	26.6

(1) The production costs at the power plant's output represent only a share of the total costs for obtaining electric energy for a particular use; the costs to guarantee the supply of electric energy according to user requirements (output control, cold and running reserve) as a matter of fact are quite significant, as are the costs for the transformation, transmission, and distribution of energy. These costs in practice do not depend on the type of power plant and turn up in various magnitudes, depending upon the level of delivery voltage and the way in which the power is taken out.

Common Assumptions:

Implementation rate at constant money value amount to 5 percent (in other words, at net inflation);

Amortization over 25 years;

All costs updated as of 1 July 1980;

Use of power plants for 6,000 hours per year.

The economic estimates were made, in accordance with international practice, in terms of constant currencies and with reference to prices existing as of a certain date (1 July 1980); this was done to avoid the degree of arbitrariness connected with assumptions as to the future development of the domestic and international rates of inflation, necessary for an estimate at current prices.

The figures given in the table would correspond to the actual costs only if there were no inflation, an assumption which must now be considered unrealistic. Inflation obviously entails a rise in the indicated costs but does not alter the ratio between the costs as such in the course of the lifetime of the plants if all of the cost items are subjected to the same inflation.

Drifts in some prices as compared to the average inflation rate might alter some of these ratios but, as we said in the text, they would do so very probably in a sense favorable toward the idea of the usefulness of nuclear energy.

Specific assumptions relating to the various types of power plants:

a. For nuclear power plants:

Here we include all phases of the cycle (from the purchase of the mineral to the smelting of the slag);

This also includes the cost of dismantling;

The cost of uranium has been estimated at $42/lb U_3O_8;

b. For coal-powered power plants:

The investment costs for the transport of coal are confined to the last phase, from an existing port with adequate capacity only 2 km from the power plant;

The cost of coal (imported, with heating power of 6,000 Kcal/kg) has been estimated at 45 lire/kg as of the port of arrival;

This does not include the cost for the desulfuration plants (scrubbers) and therefore the coal considered here is of the low-sulfur-content type;

The cost of handling the coal and the cost of processing the ash is about 7 lire/kg of coal;

c. For fuel-oil power plants:

The cost of fuel oil has been estimated at 175 lire/kg at the plant.

Since the economic estimates here give us results that depend on the assumptions adopted for the financial, market, technological, and organizational aspects, the table shows the most significant assumptions considered. An examination of these assumptions reveals that the economic assumptions most favorable to coal and fuel oil have been adopted; but the margin of advantage of the nuclear source over coal remains quite considerable.

Confirming this conclusion, similar estimates were made recently by the French electric power corporation (EDF) and the British electric power company (CEGB); they point to much more considerable advantages as compared to those indicated above for the nuclear sector, as against coal and fuel oil; these corporations as a matter of fact consider the increase in the fuel cost to be higher than the average inflation rate and take into account the less than optimum conditions in the site location and characteristics of mineral fuel plants with subsequently greater investment expenditures. The convenience of each kilowatt-hour produced from the nuclear source emerges from the statistics in Table 3.3./2: the cost of production from coal as a matter of fact is about 30 percent higher and that of fuel oil is more than double. The convenience of this source is due to the great savings in fuel costs which by far exceeds the effects of the greater expenditures for the construction of the power plant, expenditures which however we must remember involve engineering work, construction and machine-building in shops and at construction sites in Italy. After a few years of operation (3 years in a comparison between a nuclear power plant and a fuel oil power plant) the difference in

investment costs is made up by the accumulated saving deriving from the fuel savings.

In addition to the above-mentioned economic convenience, which has already been cautiously estimated with respect to the estimates in other countries, we must keep in mind that the output of each section of 1,000 nuclear Mw permits a reduced annual outlay going abroad for fuel, equal to about 200 billion lire, again in prices as of July 1980, as against an equivalent output from fuel oil and about 50 billion lire compared to equivalent output from coal.

The modest significance of the fuel in the production cost of a nuclear power plant (only 35 percent, as against about 90 percent for production from fuel oil and about 70 percent from production from coal) means that a possible although probable increase in "real" prices, that is to say, at constant currency levels, for the various energy sources (price rise along with rising inflation) would imply a further advantage on the side of nuclear energy.

Furthermore, the price of natural uranium only accounts for about one-third of the nuclear fuel costs; the rest is derived from various fuel cycle phases, ranging from conversion to reprocessing, that is to say, industrial processes that are less sensitive to the energy supply market and which the Italian industry is already involved in or which it is capable to implement by itself or by way of participation with foreign industry.

It must finally be noted that the high energy content of uranium, on the one hand, guarantees lesser vulnerability in terms of any possible supply crises, because every plant works for more than a year without any fuel recharging; on the other hand, this makes possible the creation of sufficient stockpiles for several years without this implying any intolerable financial outlay or requiring vast areas of land.

3.3.3. Action

3.3.3.1. Power Plant Construction

The nuclear power plant program provided for under the plan has the objective of building 12 new units of 1,000 Mw, each, including the two units at Montalto di Castro, of which at least six should be in operation by 1990.

The implementation of such a program entails the immediate start of four units, in addition to the two units at Montalto di Castro, and the successive start of work, by certain tight deadlines, on the remaining six units; this involves a total investment of about 10 trillion lire at 1980 prices, including interest to be paid during construction. Compared to the time frame program indicated, the investments planned for the period of 1981-1983 will amount to 1.1 trillion lire (at 1980 lire) and those during the period of 1984-1990 will amount to about 8 trillion lire (at 1980 lire).

The prompt construction and operation of these power plants under the best possible conditions necessitate some actions to be undertaken parallel to the construction effort as such, which are outlined below.

Development of Safety

Although, as we recalled earlier, the Venice Conference in January 1980 confirmed the adequacy of safety standards and procedures in Italy in the nuclear plant sector, the development of safety in industrial plants of any kind--including electric power plants--and the strengthening of scientifically and technically independent control agencies, endowed with the indispensable authority to intervene in the matter of safety, constitute a priority objective of the plan.

In this context it is necessary, as announced by the administration in Venice and as confirmed by the CIPE directive of 29 April, which approved the 1980-1984 CNEN Five-Year Plan, to take control activities away from the CNEN and to establish an autonomous agency with a broader action spectrum which would also carry out surveillence functions over all activities that might be potentially dangerous to the population and to the environment. This agency will have to step up the presence of the federal government in the prevention of high risks and in intervention in emergency situations. Such a solution will have to be prepared gradually, further strengthening the operational capacity of the current DISP (National Safety and Health Protection Directorate) of the CNEN with the objective of even temporarily preventing a reduction in substantial guarantees, in the face of increased formal guarantees. The administration as soon as possible will submit to parliament a bill for the creation of a new control agency handling all high-risk activities, in other words, not just nuclear, also providing the necessary financing.

This agency will have the mission of coordinating the updating of standards in the matter of risks, emission, and dissemination of waste into the environment, also determining the economic consequences of that. It will furthermore be responsible for awarding research contracts in the safety sector to domestic research operators and also to other agencies.

The attainment of the objectives listed in the energy plan in the nuclear sector, as well as for other sectors with a high technological and organizational content, calls for the properly qualified and coordinated action of many different agencies, each of which must operate with the necessary efficiency.

The administration therefore is committed to implementing an effective and early plan for the reorganization of tasks and authorities of public interest currently excessively broken up. In particular, the following are going to have to be reorganized, gradually relieving the CNEN and ENEL of pertinent tasks:

The hydrographic and hydrogeological sectors, currently scattered among various institutions, some of which are undersized;

The meteorological sector, concentrated in the Defense Ministry which, although meeting the requirements of air traffic, does not however have any broad obligations toward other civilian users;

The earthquake sector which is not sufficiently coordinated and completed;

The echo systems analysis sector which calls for greater and more systematic overall attention to the verification of the specific aspects deriving from energy-producing sites;

The health sector, which is in a phase of operational reorganization following the application of Law 833.

For authorization and control activities in the matter of nuclear safety within the DISP, the CNEN, in the 1980-1984 Five-Year Plan, has provided an amount of 100 billion lire. The definition of the expenditures for the establishment of the new control agency and the reorganization of public-interest service call for a detailed analysis.

The emergency action plans, currently prepared for plants in operation, are going to be updated with the support of the territorial agencies interested. Consideration will also be given to the advisability of drawing up similar plans for all high-risk plants, including those outside the nuclear sector.

The updating in particular will have to provide for the following:

Arrangement of adequate local health facilities;

Organization of suitable information links between the agencies concerned with the management of the emergency as well as an efficient public information service;

Periodic operational reviews of plans also through suitable exercises.

Safety in general and nuclear safety in particular is not the result of a process of a priori drafting standards and procedures which can be considered to have been concluded in a satisfactory fashion, once and for all; instead, it is the dynamic results of practical experiences in technological development.

In line with this basic criterion:

When it comes to the preparation of the actual plans for the Montalto di Castro power plant and its successors, those improvements will be adopted which derive from technical evolution and which are compatible with the type of plants;

Indications as to the operations of already installed power plants, deriving from new knowledge gradually acquired, will be evaluated;

In building the power plants, it will be necessary to pursue the objectives of an ever more efficient system of quality guarantee.

In this context, the commitment to the safety topics in research, development, demonstration, and industrial promotion efforts assumes priority significance; these efforts have been conducted by the CNEN. The corresponding investments allocated in the 1980-1984 CNEN plan have been estimated at about 250 billion lire (1980 lire) for the proven reactor sector, adding up the efforts promoted directly by the DISP and by the various departments responsible for a portion of the actions carried out in collaboration with industry. Investments on the same order of magnitude are required for the second five-year term. It must also be kept in mind that, parallel to this and in a coordinated context, efforts must be undertaken regarding nuclear plant safety by the EEC; the pertinent investments allocated by the EEC plan for the period of 1981-1983 are on the order of 130 billions.

In the safety sector it is particularly true that research efforts necessary for the development of the nuclear industry produce important fallout of knowledge regarding other industrial sectors, thus considerably contributing to their technological progress.

The previously mentioned National Conference at Venice underscored the importance of the human factor for the purpose of nuclear safety. The plan provides for the ENI to create a professional training center which, through suitable instruments, such as plant simulators, will guarantee initial training and periodic retraining of operators in all possible operational situations encountered in power plants. The expenditures anticipated here come to 7 billions.

Development of Industrial System's Capacities

The following directions will have to be pursued with reference to the construction of thermal reactors:

The ENEL will act as the general architect for the overall planning and coordination of activities while the system's supplier enterprise will act as engineer-architect for the nuclear island;

The system's supplier industry will have to develop further organic and adequate planning and engineering capacities in order ever more perfectly to exercise the responsibility which it has without entrusting this only to the licensee;

With the immediate collaboration of the system industry and the fuel cycle and with the contribution from the CNEN toward its promotion function, the ENEL will have to complete the efforts in progress early regarding the definition of a reference project for nuclear power plants which will make it possible to promote standardization to the greatest degree. The adoption of the "standardized project" entails a reduction in plant construction times due to a foreseeable speedup in the authorization process; more efficient arrangement of main components; more flexibly programmable organization of construction activities at the site. Similar advantages can be derived during the start-up and operational phases. The definition of this project will be based on safety criteria checked out with the control authority. Authorization actions will then be started regarding aspects not tied to the specific characteristics of the individual sites, while the project planning activities will be watched over by the control authority in order to evaluate compliance with safety criteria.

The CNEN will carry out demonstration and industrial promotion programs in accordance with the provisions in its own five-year plan which are aimed at supporting the system industry in the areas indicated above as well as the component industry regarding its supplies, so as to permit domestic industry as a whole to operate under the best possible conditions of competition also on foreign markets.

In this context, the completion of the 40-MTU Cirene thermal reactor prototype represents an important contribution to the upgrading of domestic industry as a potential supplier, on the international level, of entire advanced-technology nuclear systems.

All of these programs together call for investments of about 350 billion 1980 lire for the first 5-year term. Smaller allocations, on the order of 250 billion 1980 lire, are planned for the next 5-year term since Cirene will in the meantime have been completed.

In the sector of fast reactors it is necessary to sustain and upgrade the current efforts for the main purpose--in the context of the international cooperation efforts already underway--of keeping open the option for a by no means subordinate industrial presence when the attainment of all necessary conditions will make it possible to decide as to whether to move on to the sales phase.

The agreements existing between research agencies, the electrical power producers, and the industries (systems and manufacturing) of Italy, France, and Germany constitute an adequate premise enabling Italy to play an active and responsible role in the development of the European fast breeder line.

We must therefore not waste the assets acquired through the participation of the systems and manufacturing industry, in addition to that of the ENEL, which is significant from any angle (financial, business management, technological), in the construction of the Creys Malville (Superphenix-1) power plant; the current presence of Italian industry in the study on the next fast breeder plant (Superphenix-2) is a good point of departure as of the start of the reference project.

The development, demonstration, and industrial promotion program involving fast reactors, planned by CNEN, is important to the economic commitment and the selection of objectives, and, on the one hand, will make it possible to come up with a concrete demonstration of the ability of the entire domestic system to do the planning, building, and licensing of a fast reactor with significant dimensions and technology although with limited capacity--and this can be done through the construction of the PEC [fuel element testing] reactor. On the other hand, this program must support the nation's industry so that it may effectively and specifically become involved in the successive developments of this line through pertinent experiments above all regarding safety aspects. A contribution in that direction will be made by the PEC reactor when it becomes operational as a research tool using fuel from fast breeder reactors.

All of these efforts together call for an investment--on the part of the CNEN during the 1980-1984 5-year period--of about 800 billion lire at 1980 prices, including about 35 percent going for safety aspects alone. This can make it possible to cover expenditures for Italian participation in the preliminary project for the Superphenix-2 amounting to 10 billion lire, while it will be necessary more thoroughly to go into the commitments to be undertaken for direct participation in the construction phase and the financial coverage mechanisms for the attendant expenditures for the industrial operators. The dimension of investments required for the successive period of time will have to be evaluated in the light of the fact that the PEC reactor will be completed in the meantime. This kind of evaluation will depend on the decisions to be made regarding Italian participation in Superphenix-2, decisions which will have to be in line and consistent with the actions already taken.

Plant Site Location

In order promptly to identify the sites for the power plants to be ready by 1990--whose commissioning by the predetermined date is a firm objective of the program--it will be necessary to speed up the work of the mixed regional-CNEN-ENEL committees for the evaluation of the areas indicated on the "site map" through timely government action also in relation to the social-economic aspects and the regional development programs.

The results will gradually be submitted to the CIPE and the Interregional Consultative Commission.

The ENEL will be authorized by the proper agencies to pursue the technical investigation on the spot in order to ascertain the suitability of the "areas" proposed by the mixed committees. The evaluation of results deriving from such investigations will be performed by the control authority according to the procedures provided in Law 393.

The plant site location procedures must be handled briskly through the implementation of Law 393; the federal government is studying some amendments to that law in order to speed up some of the process which, in the light of experience, have turned out to be too laborious, especially in view of the fact that the CNEN now has produced the "site map."

One modification which, in more specific terms, would improve the decision-making contribution by the local authorities on the various levels could satisfy the authorities proposes the popular referendum on the repeal of that law.

Early passage by parliament of the methods for allocating contributions, from the ENEL to the regions and the communities, on the basis of the electrical energy produced by it in accordance with Law No 702, possibly amended in order better to spell out the significance and method of handling the contributions as such, could solve many problems of a social-economic nature which are going to be raised by the local communities. These contributions can be used for the social-economic development plans pertaining to the particular district where the plant is to be built, not just in the energy sector (for example, availability of hot water for agricultural uses or heating), as well as in various different sectors. Parallel to the actions to be undertaken in order to improve the authorization procedures in force regarding the placement of the nuclear power plants, a procedure will be spelled out also for the placement of nuclear fuel cycle plants.

3.3.3.2. Fuel Cycle

Supplies

To meet the raw material needs in relation to EURODIF, the ENI has guaranteed the availability of 13,000 t of U_3O_8 through foreign purchasing contracts; this quantity is certainly enough until 1990 in order fully to meet the needs of the nuclear program. Once the authorization problems have been solved, the ENI will exploit the domestic resources identified; they have been estimated at something like 1,500 t U_3O_8.

A contribution, equivalent to about 5,300 t of U_3O_8 to the availability of natural uranium, derives from the processing of spent uranium, belonging to the ENEL, in the EURODIF plant, with the intention of reducing the expenditures springing from the failure, on the Italian side, to use the enriched uranium withdrawal quota due Italy.

Concerning enrichment services, in an effort to have the volume required by the anticipated development of the nuclear electric program ready in advance, the CIPE in 1973 authorized the CNEN and Nuclear AGIP to participate as partners in the EURODIF Company with the purpose of putting up, on the European level, a plant for uranium enrichment, using the gaseous diffusion method. Stockholder participation in the EURODIF company necessitated the withdrawal, by each of the partners, of 11,550 t of ULS (separation work units) during the period of 1979-1990.

The ULS drawing rights from EURODIF (the right held by CNEN was transferred to ENEL), plus the services which Nuclear AGIP had obtained in the USSR (about 4,000 t) and which ENEL had procured in the United States (about 950 t), raised the total available volume to about 28,000 t of ULS during the period until 1990.

Following the delay in the nuclear electric program, major surpluses of enrichment services developed; to reduce them, the two Italian partners of EURODIF, with the approval of the federal government, negotiated and secured--as we said before--the reduction of stockholder participation from 25 percent to 16.25 percent. In spite of this reduction and the treatment of spent uranium belonging to ENEL--assuming the development of the nuclear field as outlined in the present plan (six new power plants in operation by '990, plus another six power plants under constuction), we are going to have surplus enrichment services available throughout the entire period of 1980-1990.

In 1990, the surplus will still come to 8,000 t of separation work, a quantity capable of covering the total requirements until 1994, assuming that we continue beyond 1990 with the installation of 2,000 MTU/yr.

This surplus implies a tieup of capital and rather heavy financial expenditures on the order of several trillions.

But we must underscore the significance of the strategic reserve which this available volume (equivalent to more than 100 Mtep by 1990) represents in meeting future Italian energy needs and to promote exports of power reactors by Italy's domestic industry. These are expenditures which--both in terms of magnitude and in terms of their nature--cannot be allowed to burden normal enterprise management.

The constitution of such strategic reserves of enriched uranium is a significant problem of national interests which implies action by the federal government according to methods and quotas to be defined, so as to bear the attendant significant costs.

The contribution to the expenditures could also come from the sale of a portion of the surplus on the foreign market through supply contracts, via Nuclear AGIP involving enriched uranium or manufactured nuclear fuel; but we must note that this operation, at least in short-range terms, is not easy to carry out, given the current surplus in the supply over the demand on the international nuclear fuel market.

We can confirm, in conclusion, that the most effective way to transform the country's resource--as represented by already supplied enrichment services--into effective energy availability consists of the planned installation of nuclear power plants. (In any case it must be kept in mind, in terms of specific projects, that it is necessary to expand the UF6 storage capacity at an investment of about 10 billion lire in 1980.)

Finally, plans call for support efforts by the CNEN for domestic industry so as to sustain its possibilities of exporting components having to do with first-generation uranium enrichment technologies (gaseous diffusion). The CNEN is planning a stronger commitment, in the research area, to second-generation isotope enrichment processes which may potentially be competitive (especially via laser). The pertinent money is included in the CNEN plan.

Fuel Element Manufacturing

In this sector likewise, which was dimensioned in line with the indications of the 1975 energy plan, we will on short notice have a surplus production capacity in spite of a certain degree of caution; the FN production plant, associated with Nuclear AGIP at Bosco Marengo has operated during its 6 years of service with an average utilization factor of around 25 percent, although it had been run only at half (100 t/yr) of its cutoff capacity.

To meet the needs of power plants in operation by 1990, plans call for the attainment of cutoff capacity of the BWR line, and the possible construction of a PWR element assembly line section, with the pertinent infrastructure facilities. Furthermore, starting in 1990, we want to increase the output capacity to 400 [symbol emission in original]/yr, with a further doubling of the manufacturing plant.

Parallel to that it will be necessary to complete the Bosco Marengo plant with the section for the conversion of UF_6 into UO_2 powder.

The investments for nuclear fuel manufacturing, to guarantee a capacity of 400 t/yr for light-water reactor fuels, will come to 70 billion 1980 lire.

The efforts of the CNEN, in collaboration with Nuclear AGIP, are aimed at the ever greater assimilation of light-water reactor fuel manufacturing technologies. A significant opportunity for the acquisition of concrete experience is represented by the manufacturing of fuel for the Cirene reactor in collaboration between Nuclear AGIP and CNEN, based on planning and using the pilot lines of the CNEN. The funding required here is included in the 1980-1984 CNEN plan.

Action is also necessary with relation to the development of specific capacities for the manufacture of fuels for fast reactors relative not only to Italian participation in Superphenix-1 but also in the PEC initiative. In the first case, provision is made for the possibility of an Italian contribution to the supply of fuel recharging for a share amounting to one-third of the total. Regarding the PEC, the significance of the plant itself as an instrument in fuel experimentation, calls for a high-grade Italian commitment in the development of the pertinent technologies. The first charge and the successive recharges for the operation of the plant are therefore being accomplished. Given the nature of development, which is so characteristic of these activities, and the quantity and quality of specific knowledge and

equipment available at CNEN, it is particularly necessary for us to have close operational collaboration between the CNEN and Nuclear AGIP which, according to an agreement for obtaining French knowhow, together with the French Atomic Energy Commission has established a company called SF (Manufacturing Company) for the construction of a plant to be erected in Basilicata. The effort to find the proper place however has been running into some trouble. The administration is confirming the advisability of erecting this plant and is urging the interested parties to undertake the necessary steps as quickly as possible.

The investment cost of this mixed-oxide element manufacturing plant with an output of 14 t/yr, has been estimated at about 150 billions in 1980 lire. The CNEN plan for the first five-year term includes only funds for development activities and for the supply of the PEC reactor fuel. A similar financial commitment is provided for the next five-year term on the CNEN.

Irradiated Fuel Reprocessing

The size of the domestic market does not justify the commissioning, in Italy, of a reprocessing plant at least until the middle of the nineties.

The situation in this important phase of the fuel cycle is such as to consider it improbable that some countries might in the future be inclined to operate irradiated fuel reprocessing plants for third countries and, in any case, to process highly-radioactive waste deriving from the operation.

It is therefore necessary for Italy as of now to make a high-grade and major effort in this sector along the following lines:

Use of the Eurex plant of the CNEN for irradiated fuel reprocessing pilot runs, with the fuel coming from proven power plants currently in operation in the country; in addition to the direct contribution to meeting the limited immediate reprocessing demands, this experiment is designed to enable the system in Italy to develop the necessary level of systematic and qualified knowledge necessary in order to proceed to industrial projects possibly within the context of international cooperation--whenever market conditions would justify this.

Execution of the overall project for an industrial plant.

Utilization of the ITEC [Fuel Reprocessing and Remanufacturing Plant] facility of the CNEN as an instrument for perfecting the components for a reprocessing method specifically for fuel from fast breeder reactors; this is necessary in order to complete knowledge on the entire fuel cycle which represents one of the most high-grade aspects of fast breeder reactors.

In this sector, CNEN and Nuclear AGIP will operate in close collaboration, combining their respective authority. The first phase will bring the establishment of a mixed company with mostly development and demonstration tasks, the major effort being made by CNEN which, at the proper time, will be supported by a company, mostly run by Nuclear AGIP, oriented toward industrial activities and also ready for possible participation by ENEL. In this context we are going to pursue the objective announced by the CIP in its 23 December 1977 document which assigns to a mixed ENI-CNEN company, with ENI majority, all of the industrial activities concerning the phases of the fuel cycle down-line from the reactor.

The funding necessary for the reprocessing sector is provided for in the CNEN Five-Year Plan although it is limited to the period of 1980-1984. The determination of resources necessary for the next period of time is tied to the decision which is going to be made relative to the industrial reprocessing plants. For this purpose, investments of about 50 billion lire, during the second half of the decade, have been estimated.

Pending the availability of suitable reprocessing services on an industrial scale, the irradiated fuel discharged by the operating power plants will have to be stored for a period of time of as much as 10 years at least.

The more immediate measure in this connection is to equip the pools of all the most modern power plants with high-intensity storage racks. Their construction calls for an increase in the investments which--compared to systems currently employed for normal fuel storage--can be estimated at between 3 and 4 billion lire per unit of 1,000 MTU.

For the first-generation power plants (Trino Vercellese and Garigliano), whose structures can be easily adapted to the new requirements of this storage system, we are going to adapt the pool of the Avogadro di Saluggia reactor for use as a storage basin. Around the middle of the eighties, we will build a centralized irradiated fuel storage basin, possibly the beginning of a future reprocessing plant. This project will be assigned to the same majority operating company, the Nuclear AGIP, with CNEN participation, the latter operating in the field of fuel reprocessing. The investments planned for a centralized storage basin with a capacity of about 2,000 t of irradiated fuel, amount to 100 billion lire at 1980 prices.

Handling and Treatment of Radioactive Waste

Regarding the problem of highly-radioactive waste [slag], which arises as a problem of overall optimization and not a problem of technical feasibility, for whose final solution a considerable span of time is nevertheless still available, we are going to study the Italian argillaceous formations which can be used for the confinement of highly-radioactive or long-life solid waste. This specific line of action is part of broader international cooperation in which Italy has been participating for quite some time.

A first aspect of the problem of specifically building industrial infrastructure facilities will come up after 1990, the date scheduled for the return, to Italy, of waste treated after an adequate period of cooling, according to the provisions of the contracts drawn up with foreign operators for the reprocessing of fuel from first-generation power plants.

It is necessary rapidly to start the identification of at least one suitable site not only for the storage of such quantities, which are rather modest right now, but also more generally as places for the deposit of treated waste.

The low-radioactivity waste disposal technology is defined rather satisfactorily and primarily entails the requirement for an operational service that will guarantee the systematic processing of waste of this type coming mostly from activities different from those related to nuclear electrical production, scattered throughout national territory. The Nucleco Company, recently established by Nuclear AGIP and

CNEN, will operate in this sense, implementing the 11 July 1980 CIPE decision. The money necessary for activities involved in handling and locking up waste has been allocated under the CNEN plan for the first five-year term; the orders of magnitude should remain unchanged for the second five-year term.

The complex of actions spelled out in the CNEN Five-Year Plan for the fuel cycle calls for spending something like 300 billions for the period of 1980-1984, expressed in 1980 lire. To estimate the CNEN investments during the decade (650 billions), it was kept in mind that, during the second five-year period, activities will probably be launched in cooperation with industry for the first phase of commercial plant construction; this is particularly true of the manufacture of fuel for fast breeder reactors and the reprocessing of fuel irradiated in thermal reactors.

To this amount we must add the investments earmarked for the other industrial initiatives mentioned in the text which have been estimated at 380 billions.

3.3.3.3. Nuclear Fusion

The national program for controlled nuclear fusion is continued in the context of cooperation programs with the countries of the Community.

The development of the technological process to obtain energy production through fusion requires a considerably long span of time and huge investments. The first significant construction of plants for testing the system has been scheduled by the end of the century. Demonstration plants for the production of energy may be available in one or more successive decades.

Table 3.3./3. Nuclear Energy, Recapitulation of Investments (*) (Billions of 1980 Lire)

	1981÷83	1984÷90	1981÷90
1) *Realizzazioni di centrali*			
2) — Costruzione degli impianti	1.100	8.000	9.100
3) — Sviluppo capacità del sistema industriale	490	720	1.210
4) *Ciclo del combustibile*	350	860	1.210
5) *Sviluppo - tecnologie di sicurezza e attività di controllo*	470	900	1.370
6) **Totale**	**2.410**	**10.480**	**12.890**

Gli investimenti che si riferiscono ad attività del Cnen sono per il primo quinquennio quelli del Piano deliberato dal Cipe, qui espressi in Lire 1980, e includono le spese di gestione

(*) La tabella non comprende le attività di ricerca e sviluppo sulla fusione nucleare (240 miliardi nel decennio) incluse nel PNRE

Key: 1--Power plant construction; 2--Plant construction as such; 3--Industrial system capacity development; 4--Fuel cycle; 5--Development of safety technologies and control activities; 6--Total; (8) The table does not show research and development activities on nuclear fusion (240 billions during the decade) included in the PNRE.

The investments relating to CNEN activities, for the first five-year period, are those included in the plan worked out by the CIP which are expressed in 1980 lire and which include management expenditures.

The following actions are called for under the 1980-1984 CNEN five-year plan.

Development, within the context of Community collaboration, of machines of the "Tokomak" type with magnetic lock-in; this particularly calls for the construction of a version with increased output as compared to the Tokomak of Frascati, while a technical-economic feasibility study is underway through Ignitor; the trend which appears to emerge from the latest estimates is toward a combination of both machines in a single solution;

Maintenance of an activity level in the fusion sector with inertial lock-in, particularly through laser, which, whenever the opportunity is considered right, would make it possible actively to work toward international initiatives.

The funding necessary is indicated in the CNEN plan for the first five-year period (about 125 million 1980 lire).

The current study of the development of technology in the fusion sector suggests the advisability of maintaining a high degree of program flexibility for the next five-year period, in order to take into account any possible events which might suggest a reorientation of activities. For the purpose of this plan, we might assume the same order of magnitude for the financial commitments during the second five-year period from 1985 until 1990. A more articulated proposal for research activities in the fusion sector has been made a part of the PNRE (National Energy Research Plan) which is being drafted now by the Ministry of Scientific and Technological Research.

3.3.4. Role of Operators

The effective pursuit of activities provided for in the various directions indicated implies a precise definition of tasks and total clarity as to the role of each of the operators in the sector.

Regarding the essential aspects, the assignment of tasks and roles is now sufficiently well defined.

In addition to operating the plants, ENEL provides for the construction of new power-plants, particularly for the nuclear power plants playing the role of general architects for the drafting and coordination of activities.

The agreement recently worked out among public and private industrial groups in the sector clarifies the distribution of tasks among activities involving the system and those dealing with the components. The plant industry in particular, headed by Finmeccanica, not only acts as architect-engineer for the nuclear system, but also operates in the planning and construction phase so as to play the role assigned to it in an ever more perfect manner.

The CNEN acts as promoter of technological and operational capacities of the industrial system for the aspects of systems and components with initiatives in

research, development, and demonstration--pursued in close association with industry--not only for the construction of power plants but also for the various phases of the fuel cycle. Priority will be given to the in-depth development of the topics of safety and environmental protection.

To enable the CNEN to accomplish these tasks in the most effective manner possible, in an institutional setup which will be more homogeneous for the public operators with whom it must collaborate, the administration on 18 July approved a bill for the reorganization of that agency, aimed at giving it greater management autonomy and the possibility of better utilization of human resources, as well as the possibility of effectively controlling promotion efforts in the industrial sector through stockholder participation in mixed companies.

In line with the mission of the ENI Group, dealing with the supply of energy resources, Nuclear AGIP will act as the national nuclear fuel supplier and in this capacity will cooperate with the CNEN, the ENEL, and the other industrial operators.

The administration proposes to spell out the role of the various agencies also in those areas (hydrography and hydrology, meteorology, earthquake studies, analysis of echo systems, health services) which--although they are not specifically connected with the nuclear sector--nevertheless are significant in terms of correct operations in this sector. For this purpose, there will be an increase and a more rational distribution of tasks among the various central and local government agencies and administrations and their coordination.

The role of authority responsible for nuclear safety and health protection is to be transferred, gradually of course, so as to make sure of maximum efficiency also during the transfer phase, to a new agency which will be built around the Central Directorate of the CNEN (DISP) which currently has this task assigned to it. The above-mentioned CNEN reorganization bill provides institutional authority for the current de facto autonomy held by the DISP and is a first step toward gradual separation.

As we know, the nuclear choice presents problems of social acceptance which in part can be blamed on insufficient information work by the operators involved. This aspect is taken up in a separate chapter devoted to information on energy problems. But it is worth the effort here to emphasize that all operators in the sector have developed an increasing awareness of the need to promote a communication process here. Thus, on the one hand, it will be possible to identify society's energy information needs and, on the other hand, it will be possible to transmit the knowledge necessary for a sufficiently rational evaluation of the nuclear choice, in a context of compatibility with the general social instances.

3.4. Petroleum

3.4.1. Current Situation: Petroleum Supply

The general situation of the domestic energy system and the role played in it by petroleum and its derivatives are widely known. The key items are summarized by just a few statistics:

	1973	1978	1979	1980 (*)
1) Consumo petrolifero globale (milioni Tep)	105.3	99.2	100.6	[illegible]
2) Tasso d'incremento dei consumi petroliferi (% rispetto all'anno precedente)	+6.7	+3.9	+1.4	−0.6
3) Consumo petrolifero pro-capite (Tep)	1.9	1.8	1.8	1.8
4) Quota del petrolio nei consumi energetici nazionali (%)	75	69.7	68	[illegible]
5) Importazioni petrolifere nette (Tep x 10^6)	104.6	99.6	99.1	[illegible]
6) Grado di dipendenza dall'estero (%)	99.3	99	98.5	[illegible]
7) Costo unitario del greggio acquistato Cif (Lit/Tonn.)	16.260	82.870	117.700	[illegible]
8) Esborsi valutari per le importazioni (Lit x 10^9)	1.500	7.800	12.000	[illegible]

(*) Previsioni sulla base dell'andamento semestrale

Da questo quadro si evidenzia l'importanza del pe[illegible]lio nel bilancio energetico nazionale

Key: 1--Total petroleum consumption (millions of tep); 2--Petroleum consumption increase rate (percent as compared to the preceding year); 3--Per-capita petroleum consumption (tep); 4--Share of petroleum out of national energy consumption (percent); 5--Net petroleum imports (tep x 10^6); 6--Degree of dependence on foreign sources (percent); 7--Unit cost of crude purchased CIF (Italian lire/ton); 8--Foreign exchange outlays for imports (Italian x 10^9); (*) Estimates based on half-year developments.

This table shows the importance of petroleum in the national energy balance sheet.

3.4.2. Main Objectives

Italy depends so much on foreign sources that it must make every effort to minimize, on the one hand, the difficulties deriving from a declining supply and, on the other hand, the risks of possible interruptions in supply or abrupt price rises.

Two fundamental objectives can be derived from this:

(A) Guaranteeing regular and continuous supplies of petroleum for the country, while minimizing the cost and the foreign exchange outlay.

Unless we want to run the risk of reducing employment, there is not doubt that the contribution from petroleum to the Italian economy will remain high for many years to come. This leaves us with the fundamental importance of our capacity to guarantee resupplies in the required dimensions and without any break in continuity.

(B) Gradually modify the national energy system so as to make it less dependent on petroleum and to render it more flexible.

Italy must set itself the goal of not increasing petroleum imports above current levels, reducing the level which it will be forced to reach in 1985. This is a very serious commitment which goes beyond what has been asked by EEC or IAEA; this is more than is demanded in the resolutions of the Venice Summit of Heads of State of the Industrialized Countries.

We can therefore assume that the objective of this plan is aimed at importing crude and petroleum products amounting to about 100 million t by 1990. In all probability, future resupplies will develop according to a modal, discontinuous curve, characterized by major sudden changes in available volumes for which adequate defenses must be arranged in advance. The reduction of dependence on petroleum must be promoted also through its gradual replacement in those uses where alternate energy sources can be employed most easily.

3.4.3. Main Lines of Action

A series of actions will have to be undertaken for the next several years:

Toward the producer countries;

Toward the domestic petroleum market;

To reduce the share of petroleum out of the national energy inventory;

To strengthen the role of ENI.

3.4.3.1. Dealing with Producer Countries

The international political situation determines the development of mineral investments abroad and of purchases.

It is therefore becoming more necessary than ever before to make sure that Italy and the entire European Community will define and propose to the producing countries a strategy of cooperation rather than a strategy of opposition. For this purpose it is necessary to research and underscore factors of common interest which are many and vital for the respective economies. Here we must seek the strategic solution to the problems of petroleum supply. Every opportunity for dialogue, study, and useful undertakings toward this end must be promoted and developed constantly, also in line with what is requested and hoped for by the producer countries.

There are several levels on which it is necessary to establish timely contacts with the enterprises and the producer countries.

An Italian effort to tackle both the major problems of international inflation and monetary devaluation and to develop, in accord with the governments of the producing countries, instruments of intervention in the emerging countries which are not producers or to develop a strategy of support for the development plans of the petroleum-producing countries, also offering shares of our market, for example, for chemical or petroleum products, can be of very great importance.

A fundamental instrument in this policy is the effort of the ENI, the only Italian enterprise which is doing petroleum prospecting abroad to supply the domestic market.

This activity by the ENI is carried out along with a strong processes of institutional transformation in the petroleum industry which has now enabled the producer countries to dominate prospecting and production in their areas and in particular to fix the quantities to be produced, as well as the prices. But in this context likewise, mining prospecting retains many of the fundamental reasons for its importance.

Recent history teaches us that, even when petroleum reserves and production were nationalized, the petroleum enterprise, which had developed them, very often retained privileged conditions of availability over a good portion of the output (the so-called "equity crude" and the "buy-back crude").

Moreover, the costs of crude coming from company-owned deposits often include goods and services coming from the country of origin of the enterprise which derives profits from that in foreign-exchange and industrial terms. Moreover, the development of mining enterprises facilitates the development of in-house technologies and in-house knowhow, domestic manpower skill training, and can make a contribution to international cooperation.

Finally, mining efforts can permit the diversification of the origin of our own supplies and hence enable us to maintain partial independence. It thus appears necessary to put together a frame of reference in support of the foreign petroleum mining initiatives of the ENI and also possible private operators who might wish to resume or start up prospecting aimed at providing supplies for the nation.

The new institutional situation certainly does not enable us to plan our foreign mining activities in line with the traditional standards of the petroleum industry during the sixties. All of the producer countries have created their own government petroleum companies to which they allocate growing quotas of crude and an ever broader role in pospecting and production, in some cases, even an exclusive role.

In any case, there is a specific desire on the part of those countries directly to manage the various phases of the petroleum industry. It must nevertheless be noted that the big producer countries, especially those in the Middle E st, have for many years been characterized by scant exploration activities.

In this framework, there is proportional space left for the capacity to cooperate with the petroleum companies of the producer countries by offering them the prospecting, exploration, and mining technologies.

In the future, access to a good portion of crude available throughout the world will depend on the capacity to offer those services.

To this end, suitable actions will be planned so that the ENI and the other Italian public and private operators may thoroughly explore the possibility of accord and cooperation with the producer countries in order to assist and support their economic and social development. For this purpose it is necessary to be able to offer services, plants, high-grade goods and technology, in forms of more flexible and

diversified action, also beyond the petroleum cycle, with "packages" of complex services or by assuming the role of "contractor" in advanced sectors.

The possibilities of cooperation also involve refining and product distribution. Various exporting countries are now oriented toward putting up their own refining capacities and becoming net exporters of products for which they do not yet have adequate outlets on the market.

3.4.3.2. Dealing with the National Market

The general conditions on the energy market today necessitate the adoption of very large-scale and broad strategy outlines which can be summarized as follows.

(a) Flexibility, Efficiency, and Control of Sector

From the viewpoint of energy supply, the current situation is characterized by a high degree of uncertainty. The worldwide demand for crude is met by a production volume which, at least on the part of the producer countries belonging to the OPEC, is aimed at the objective of extending the lifetime of petroleum resources; it is therefore tightly calibrated to prevent the formation of surpluses which, among other things, would exert pressure on prices. Technical accidents in production and transport of crude, which would have meant little during other phases of the market, could today cause disturbances of great amplitude. For this purpose it is necessary to make sure that the entire transportation system (tanker fleet, ports, and oil pipelines) be maintained at a level of high efficiency in its various components in order to prevent dangerous bottlenecks which would have an effect on the costs and regularity of resupplies. Initiatives aimed at the rationalization of the transportation infrastructures are therefore considered to be of particular importance, especially regarding petroleum ports which will have to adapt to the evolution of the tanker fleet rather early. Besides, petroleum output is extremely vulnerable to unforeseeable political events. The domestic petroleum market must therefore be improved in terms of organization so that it may adjust without too many difficulties to sudden changes in supply in terms of quantity or prices. Among the changes which are already foreeseable right now there is greater resource to petroleum products already refined rather than crude; the start of importing substitute products not derived from crude, such as LPG derived from production or methanol from associated natural gas.

The main strategy recommendation is to obtain and maintain the petroleum cycle in every point and at every moment at maximum flexibility. The big and little consumers of petroleum products must remain flexible in order to be able on short notice to switch to energy sources different from those used until a particular moment. The logistic systems must be flexible and they must be able to change points of departure and destination so as to adjust to unexpected geographic shifts in production; the same applies to storage systems which must be able effectively to respond to very fast changes as well as the processing plants which must adjust to different types of crude or different delivery requirements; the distribution systems must be able to sell more diversified products, rapidly also coordinating with the "heat selling" system. Along with this and by way of supplementing this indispensable flexibility, it is necessary for the domestic energy system to be maintained under more precise and specific control than has been the case in the past. All systems and plants in the petroleum cycle, including the utilization plans, will have to be

equipped with the most advanced monitoring and control devices, aimed at controlling consumption, optimizing the energy yeild from consumption and transformation, and preventing inefficiency and waste.

Finally, it is necessary for the domestic petroleum system to be rendered more efficient so as to reduce its costs throughout the entire cycle which takes place on national territory in order to be able to reach the lowest proportion of costs possible at an energy cost which is already very high and which will certainly go up in the future at a higher rate than in the past.

Large Number of Operators

A primary requirement in planning the Italian supply is to diversify the sources not only in terms of geographic area but also in terms of operators. Reasons of safety advise us to make sure that the Italian market will be resupplied by a large number of operators, particularly including those who have access to large quantities of crude.

The 1977 energy plan hopes for an increase in the ENI share beyond 40 percent of the market. This is still a good idea. But on the other hand we have excessively rapid growth phenomena caused, not by an organizational setup geared toward that goal, but rather by the collapse of the market share of the national independents which are now deprived of crude.

It is also in the national interest to bring about a greater commitment on the Italian market by the big petroleum companies and to promote the entry of new enterprises, directly or indirectly tied to the crude producing countries, by also offering them shares of the market.

Table 3.4./1. Shares of Principal Operators on Italian Petroleum Market (%)

1) Operatori	1973		1978		1979		1° quadrimestre 198°	
	2) sul greggio importato	3) sul consumo finale di prodotti	2) sul greggio importato	3) sul consumo finale di prodotti	2) sul greggio importato	3) sul consumo finale di prodotti	2) sul greggio importato	3) sul consumo finale di prodotti
Eni	18	18	31	32	41	37	45	40
4) Major (a)	82	82	38	38	36	38	40	39
4) Indipendenti			31	30	23	25	15	21
5) Totale	100	100	100	100	100	100	100	100

a) (*) Esso, Amoco, Chevron, Conoco, Texaco, Elf, Fina, Gulf, Mobil, Total

Key: 1--Operators; 2--Out of imported crude; 3--Out of final consumption of products; 4--Independents; 5--Total; (a) Esso, Amoco, Chevron, Conoco, Texaco, Elf, Fina, Gulf, Mobil, Total.

Price Policy

The current system for the definition and control of petroleum product prices is being carefully checked out and reviewed. Errors in its setup and application as in the past would cause exclusively national crises in supply and could entail forced steps toward energy savings.

It is therefore of vital importance for regular and continuing supplies for Italy to make sure that the crude will be processed--without delays and uncertainties--as it is on the other European markets. Otherwise, when supplies are low, private operators would on a priority basis decide to resupply the more profitable markets also at the risk of creating temporary and serious shortages on the Italian market.

These shortages could be covered under critical conditions and with serious losses by the public operator who would then face a continuing and rising risk in his entire planning effort.

From this viewpoint it is necessary to review the structure of prices which today is broken down into administrative and controlled prices, so as to work out a system of "carefully watched liberalization," in other words, a mechanism of automatically adjusting domestic prices to international prices, accompanied by public control which would rule out any speculative actions by the enterprises. This adaptation constitutes the main incentive to persuade current private operators to remain in the market and to add new ones.

In this system, ENI will represent the instrument for implementing certain public policies by operating through its own lists and prices as a regulator and indicator of market situations.

Promotion of Mining Activities in Italy

The Italian geological situation has not revealed and does not promise to reveal hydrocarbon reserves comparable to those of the big producer countries. Besides, its potential seems to be more in the gas field than in the oil field.

In spite of the enormous development of mining prospecting achieved so far, there are still valid topics of research on which the activities of the operators can be concentrated:

The Po Plain with respect to surface stratigraphy topics and very deep residues;

The continental shelf between the 200-m isobath can supply other discoveries although it has already been thoroughly explored;

The off-shore areas at depths beyond 200 m where prospecting was started a short time ago (zone F, Ionian Sea, Southern Adriatic);

Tertiary basins of the Po Plain and the lower Appennines where the use of new prospecting and data processing techniques can offer further developments.

We certainly cannot expect any radical changes from this prospecting; even under the least pessimistic assumptions, the crude production capacity could hardly exceed

several million tons per year, in other words, just a few percentage points of the national requirements.

For gas, the situation is similar and here we can consider--again by the end of the eighties--a production capacity of 11-12 billion cubic meters per year, of which only 7-8 billions would be extracted, while the rest would be destined for the strategic reserve.

Parallel to traditional prospecting, the ENI will also study and prepare an inventory of possible resources, such as bituminous shale and heavy oils which in the future will be developed quite considerably on an international scale.

The hoped-for resumption of mining activities in Italy--under the above-indicated conditions of high risks and heavy costs in return for rather modest discoveries--can come about only in the presence of an adequate reform of current petroleum standards and legislation. The new law will have to promote organic and broad-scale programs so as to cut speculators off from action possibilities and to help those who come up with serious and high-grade prospecting programs. It must furthermore be such as to promote operational continuity by working toward the allocation of funds intended for re-use in exploratory prospecting.

Profound revisions in the above-mentioned sense--in other words, to provide greater incentives--must also be provided for the specific activities of regions with special status.

Although recognizing the fundamental role of the ENI and the need for promoting initiatives to the maximum extent, the multiplicity of operators must also be maintained in the petroleum extraction sector and the continuation of activities by private operators must be further encouraged.

Rationalization and Reorganization of Italian Petroleum Industry

During the next decade, the Italian petroleum system will be subjected to pressures --even mutually contradictory ones--which will significantly influence its structure.

The petroleum producing countries on the one hand will try to increase their market of heavy crude, of which they have large reserves, and on the other hand they will try to develop their own refining operations with the intention of replacing a good portion of their crude exports with petroleum product exports. These two policy lines will tend to push up the share of heavy crude in the domestic petroleum supply and will press toward an increase in the quantity of heavy products; furthermore, by developing a supply of petroleum products of their own, these countries will be able to cause a further deterioration in the Italian surplus refining capacity which is already brought about by the slower development of the oil demand and the loss of the role of refining country along the Mediterranean routes of crude going toward the countries of northern Europe.

The policies of the consumer countries and the energy policy outlines of Italy will tend toward an increase in the use of coal, primarily at the expense of fuel oil. The development of nuclear energy will have the same effect. The demand for petroleum products from the consumer countries will therefore always be made up of light products such as gasoline and gas-oil. Its structural transformation in all

probability will be promoted by the petroleum companies which will be interested in a higher upgrading [value-added] for each barrel of crude.

The sector's planning effort thus faces a double problem: the problem of drafting a policy capable of, in time, providing the capacity for the nation's refining needs, with reduction which can go beyond what has happened in various ways so far; and the problem of improving the remaining capacities in order to increase the yield of medium and light products, derived both directly from crude and by reprocessing the heavy fractions.

This will make the entire system more complex in logistic terms and in the area of technical management and it will entail new investments of rather significant size. For example, it will be necessary to plan new conversion plants which will have to be even better than those now in operation in order to increase the product yield. These programs are going to have to be carried out within a framework coordinated on the national level and involving the operational structures so as to avoid superfluous investments which obviously would constitute a waste of money.

The storage and distribution systems are also going to have to be seriously revised. The need for the increasing flexibility and safety of the Italian petroleum system and the need for enabling it to respond to unexpected crises advise us, on the one hand, to increase our petroleum and petroleum product stocks, using the existing capacities, and, if possible, also employing the capacities and services available at the refineries which can be closed down; on the other hand, the Italian oil system must be able to respond to diversification requirements by getting into the motor fuel and alternate fuels market (methanol, LPG, coal-oil, etc.). Concerning LPG (liquefied petroleum gas), the producer countries have registered a growing volume primarily due to the production of gas associated with crude.

It is estimated that the availability of LPG which can be exported to the industrialized countries comes to about 40 million t. A good portion of this available volume is today burned during the phase of extraction whereas it could be usefully employed.

Some producer countries recently as a matter of fact expressed the intention of selling significant quantities of LPG on the international market. It is therefore necessary to examine the possibility of starting the construction of one or more terminals and suitable tankers capable of handling the transportation here.

This important reserve can thus be utilized to meet consumption needs in the transportation, heating, petrochemical, and agricultural sectors.

The same requirement for flexibility applies to the distribution system which, in turn, must still absorb the disorderly development of past years, which entailed an excessive reduction of sales per resupply point, with a corresponding rise in costs. It is therefore necessary to provide for more decisive action in the reduction of the network, in the light of what has been done already in the principal European countries.

We should thus move along the following lines primarily:

Extension of ban on release of new concessions for highway fuel distribution facilities [gas stations] until 31 December 1982;

Once stations pumping less than 100,000 liters have been closed down, take steps to close down other stations in the spread between 100,000 and 200,000 liters, over a period of 5 years; It is estimated that this would entail a reduction in the number of stations to about 300,000 units and an increase in the average gasoline pumped per station;

Establish a fund for indemnity to be given to the operators of stations to be closed down and establish a mandatory consortium involving all operators to manage this fund;

Provide for an increase in sales outlets equipped with self-service by offering an incentive for the use of these facilities by the driving public, along with a price policy featuring lower prices than those posted at sales outlets which provide full service.

To handle this complex of requirements, energy planning will have to operate on various coordinated levels. On the one hand, it will not be able to ignore the international character of the Italian petroleum industry due to the fact that we process imported crude and re-export significant quantities of petroleum products toward the markets in Europe and outside Europe (although these exports have gone down in recent years). On the other hand, it will have to spell out and implement adequate instruments of action and control which, endowed with the necessary flexibility, will permit timely and coordinated decisions.

Regarding the first topic, it should be noted that the action aimed at the rationalization and improvement of the Italian petroleum industry must necessarily also be undertaken with reference to the authorities in the petroleum producing countries.

Italy must start broad negotiations with those countries along two main directions: the first one would deal with entry upon the market of products coming from those countries, be they producers of petroleum or chemical derivatives (ethylene, methanol, etc.) which can be peocessed by the Italian chemical industry (which would thus reduce its demand for virgin naphtha) or which could be used as raw materials or directly after proper processing.

In second place, we would have the possible commitment of the producing countries within the domestic petroleum industry, either through commitment of processing capacities already existing in Italy to resupply their market areas with products, or through their direct intervention on the Italian market with distribution networks, storage facilities, and refining capacities backed up by an adequate availability of crude. Making the authorities of the producing countries aware of these possibilities would enable us to start negotiations with some of them in order to transform a situation which looks anything but favorable into improved Italian petroleum supply conditions. As for the control system, it would have to be implemented through supply, processing, and sales plans for consumption purposes, drawn up in line with the multiannual system worked out by the public administration with the support of the operators.

This in substance means also a long-term extension of programs already drafted and it means using them as program instruments, not just estimate elements.

3.4.3.3. Action to Reduce Share of Petroleum in National Energy Balance

The efforts connected with the replacement of petroleum in the various economic sectors are primarily connected with the various efforts dealing with sources other than petroleum and conservation. These therefore are the places which are most suitable.

There is no doubt that, on top of any business operations and any regulations in this field, there would have to be a vast volume of investigations backed up by feasibility studies regarding the degree and technical-economic conditions of replaceability and competitiveness concerning the use of the various sources as compared to the final uses of energy.

Beyond basic studies it is necessary to launch investigations and operations research in the field of technical and economic feasibility.

A specific process of replacing petroleum however can be developed on a conspicuous scale only if it is supported, particularly through those actions which are most risky and which are not at all economical.

Over the next several years, an entire complex of conspicuous steps, designed to provide encouragement or restrictions must be worked out at least in two directions:

(a) Energy savings--to be implemented with instruments and actions provided for under the plan for energy conservation;

(b) A policy for the replacement of petroleum to be implemented with tariff, fiscal, and incentive instruments to reduce the use of petroleum products in sectors where alternate energy sources can more easily be used.

3.4.3.4. Actions To Strengthen the Role of ENI

In the context of actions outlined ENI will have to play a very important role.

This government agency today must cope with major requirements on the Italian market, following the latest oil crisis. Its share went up rapidly by several percentage points over the last 18 months, and it is now around 45 percent in terms of crude imports and 40 percent in terms of the share on the national market.

While doing everything it can to retain the large number of operators on the market, it appears inevitable that we must look to a further increase over the next years in the presence of the ENI on the domestic market, in view of the serious tasks which the administration recently assigned to this government agency in the field of petrochemistry, with the transfer of the plants SIR and Liquichimica and in the field of refining and distribution with the assignment of the activities of the Monti Group.

In the light of the above it appears evident that the ENI--retaining the considerations on the large number of operators--will considerably have to increase the

quantity of crude to be supplied; toward the middle of the eighties, that quantity might be around 50 million t.

The ENI must therefore increase the current, already very high level by another more than 10 million t/yr. This will demand a further effort on the part of the ENI which must organize itself adequately in order to attain the new objectives; first of all this must be done through a strengthened and expanded capacity for conducting negotiations with the producer countries, for the acquisition of new prospecting areas where crude would be available, as well as a plan for the development of mining activities in Italy and abroad, above all in zones with acceptable mining and political risks.

For this purpose, the ENI programs, which already for the 1980-1985 5-year period, call for investments of 1.9 trillion lire in Italy and 3.0 trillion lire abroad, must be realistically reviewed. The action of the ENI will have to be developed not only to supply crude but also--in relation to the greater volume available in the Middle Eastern areas--the supply of refined products. To this we can also add LPG and methanol obtained from associated gas which should improve the mix of products by contribution to greater flexibility and alternatives in the system.

In the field of refining it will be necessary for the ENI to adjust its own production structure in line with the evolution of the petroleum product demand and the probably heavier grade of available crude and, finally, in relation to the new commitments in the petrochemical sector.

This coordination will have to have the primary objective of making the processing cycle more economical and hence to optimize it and, as a secondary objective, it will have to reduce the quantity of crude and products to be imported, also in the light of the coal and gas imports estimates.

The ENI investment programs for the next 5-year period will to a growing degree have to tackle the problem of the conversion plants in order to increase the yield of medium distillates which represent the key product in the entire system.

In the distribution sector, the action of the ENI will be in line with the action outlined earlier on the national level and that implies the rationalization of the network.

Table 3.4./2. Petroleum--Recapitulation of Investments (*) (Billions of 1980 Lire)

	1981÷1983	1984÷1990	1981÷1990
1) *Azioni verso i Paesi produttori*			
2) Interventi e investimenti dell'Eni per proseguire e sviluppare le attività minerarie petrolifere all'estero	2.000	5.000	7.000
3) Aumento delle importazioni di prodotti. Partecipazioni in raffinerie estere per l'esportazione	150	350	500
4) Avvio di un sistema di importazioni di metanolo, Gpl, Mtbe e altri prodotti non di raffineria	40	60	100
5) *Azioni sul mercato nazionale*			
6) Indagine pubblica sulla sostituibilità del petrolio con altre fonti	5	—	5
7) Promozione delle attività di ricerca e coltivazione di idrocarburi in Italia	2.500	7.500	10.000
8) Interventi e investimenti nell'industria per l'impiego di Gpl	250	550	800
9) Interventi e investimenti dell'industria pubblica e privata per la riconversione e riqualificazione del sistema di raffinazione	700	1.300	2.000
10) Interventi e investimenti dell'industria pubblica e privata per la riconversione del sistema di trasporto, deposito e distribuzione	300	700	1.000
11) Aumento delle scorte d'obbligo detenute dall'industria petrolifera	300	600	900
12) Costituzione di scorte strategiche di greggio	300	600	900
13) Completamento centrali termoelettriche ad olio	1.300	240	1.540
14) TOTALE	7.845	16.900	24.745

(*) La tab. non comprende attività di R. & S. per Lmdl. 200 incluse nel PNRE.

Key: 1--Actions aimed at producer countries; 2--ENI undertakings and investments to pursue and develop petroleum extraction activities abroad; 3--Increase in product imports, participation in foreign refineries for export; 4--Start of system for importing methanol, LPG, Mtbe, and other products not coming from refining; 5--Actions aimed at domestic market; 6--Public investigation on replaceability of petroleum with other sources; 7--Promotion of processing activities and development of hydrocarbons in Italy; 8--Undertakings and investments in industry for the use of LPG; 9--Undertakings and investments of public and private industry for conversion and upgrading of refining systems; 10--Undertakings and investments of public and private industry for conversion of transportation, storage, and distribution system; 11--Increase in mandatory stockpiles to be held by petroleum industry; 12--Establishment of strategic crude stockpile; 13--Completion of oil-powered thermoelectric power plant; 14--Total (*) The table does not include the research and development activities in the amount of 200 million lire included in the PNRE.

[9 Jan 81 pp 18-27]

[Text] Energy Plan--IV. In this issue we conclude the publication of the Third Chapter of the National Energy Plan concerning renewable sources and alternate fuels.

3.5. Renewable Sources and Alternate Fuels

Premise

The plan calls for using renewable sources (solar, wind, biogas, water power, geothermal, alternate fuels) as part of the efficient use of energy in housing construction, in industry, in agriculture, and only marginally in the electric energy generation sector.

Regarding transportation, the plan contemplates efforts designed to develop the use of methanol in mixtures with gasoline and ethanol, as a possible stabilizer for the mixture.

The development of the full use of renewable sources in their various forms however, cannot materialize in a constant manner if urgent initiatives are not going to be taken in terms of industrial policy, research, and technological development.

While, regarding the aspects of research more properly speaking, we look to the National Energy Research Plan, we want to look at those efforts in this chapter which we believe we should launch in order to promote the industrial development of such sources. The demonstrative efforts and the forms of providing incentives for their dissemination in the various utilization sectors are given in Chapter IV and in Table 3.5.3.

3.5.1. Solar Energy

(A) Low-Temperature Systems

The production of flat solar panels for low-temperature uses has been developed in Italy over the past three years from just a few thousand square meters in 1977 to an estimated figure of 100,000 m^2 in 1980.

The factories involved vary in size and their number is quite large (more than 40).

In order to be able to move toward mass distribution of panels, we must first of all boost industrial production both from the quantitative and from the qualitative viewpoint. Production expansion does not seem to present many difficulties and is involved in sectors of the light machine-building industry which are very much developed in Italy.

Flat solar panels (DDL [Decree-Law] 655/80) and the indications of this plan regarding the program for the substitution of electrical water heating with "solar" or "mixed" solar and electrical water heating, in other words, sun-gas, can lead to a major expansion in production activities.

Efforts To Be Made During the Coming Three-Year Period

(a) The main effort must be aimed at the improvement of the qualities of products and toward the construction of higher-yield and lower unit-cost collectors.

From the viewpoint of technological objectives under the National Energy Research Program, suitable efforts will be developed and will be aimed at the following goals:

Developing high-yield panels of the selective and medium-cost type;

Developing low-cost panels for low temperatures;

Developing high-temperature panels (100° C standard in vacuum with antiradiant structure);

Developing integrated panels for housing construction.

(b) In a sector in which we anticipate a major expansion in the demand we are going to work toward the solution of problems connected with quality control and the supply of components and systems.

The Ministry of Industry will indicate both the methods and the testing centers capable of handling quality tests. As of now we might emphasize the validity of the initiatives already undertaken in that sector by the Phoebus Company of Catania (ENEL [National Electric Power Agency] and industry) and by Craies of Verona.

The CNEN [National Nuclear Energy Commission] must also work toward the development of such activities.

(B) Concentrated Distribution System

The collector systems distributed now are made up of modular unit assemblies. They are characterized by considerable flexibility which basically makes them suitable for the generation of electric energy, process heat, mechanical energy, and their combination into so-called hybrid systems.

The system's critical components primarily are the concentrators (with linear or point fire) and the fire motors which are not of the conventional type.

Italian industry is actively committed to the perfection and optimization of all system components. It participates in current international initiatives--the 500-KTU Power Plant at Almeria--and the construction and installation in Italy of a small 20-KTU power plant as part of the cooperative effort between Italy and the United States.

A 7-KTU system, with point-fire collectors, furthermore has been built at Brindisi by Ses-Fiat and a small 35-KTU power plant, with cylindrical-parabolic collectors, was sold by Ansaldo to an Australian electrical company.

The plant's costs come to around 10-15 million/KTU equivalent to 700,000-800,000 lit/m^2 of installed system.

Efforts During Next 3-Year Period

In this sector, efforts will aimed at the reduction of production costs not only regarding parts but also the entire system. This objective can certainly be attained through two different efforts aimed at pushing up the demand and providing incentives for demonstration: both of these must be combined to constitute a guaranteed public demand which, at least for the next 3 years, will constitute the prevailing part of the market.

(a) Regarding incentives, it is felt that the provisions of DDL 566/80 can promote the installation of several thousand square meters of collectors over the next 3 years.

(b) However, the development of a demonstrative program is essential to the take-off of industry in this sector within the scope of a concerted effort mounted by ENI [National Hydrocarbons Agency] ENEL, and CNEN, with maximum involvement of domestic industry to which will be entrusted the job of building the plants through timely competitive bidding the results to be announced by ENEL and ENI. The plan will consist in the installation of plants for the generation of heat and/or electrical energy equivalent to at least 10,000 m^2 over the next 3 years.

ENEL, ENI, and CNEN will each take care of the collection and dissemination of program results for the portion within their sphere of competence.

This plan will have to promote experimentation with systems characterized by the broadest possible differentiation from the aspect of components and utilization strategy.

The plan's cost has been estimated at 10 billion lire.

(c) We must also point up the need for making sure that support will be guaranteed --within the PNRE [National Energy Research Plan]--for research and development of technologies as well as the search for new technological solutions.

(C) Tower Plants

General Remarks

In the sector of the thermodynamic conversion of solar energy for the production of electrical energy, plants equipped with towers represent the solution commonly considered when it comes to obtaining a power output with a certain magnitude.

The state of the art regarding this technology is still in an initial stage throughout the world and we are therefore far from getting competitive services.

The possibility of developing tower power plants above all is tied to the study of low-cost heliostats for large-series production, the study of transportation systems, the assembly and checkout of these heliostats, and the study of low-cost land development systems.

In this sector, Italy can boast of a long tradition above all thanks to the construction, during the sixties, of the experimental plants at S. Ilario by Prof. Francia.

Ansaldo has also sold a tower-equipped plant, similar to the one at S. Ilario, to the Georgia Institute of Technology in the United States.

Right now, Italy--through ENEL and Ansaldo--is participating in the construction of the power plant at Adrano (Catania), called Eurelios, with an output capacity of 1 Mw. As we know, the enterprise is part of a program put together by the European Community and is being built with the help of Italian-French-German collaboration.

The power plant will be completed by 1980 and will be tied into the domestic electric power grid.

At the moment of its entry into service, the Adrano plant--in addition to being the first European solar power plant equipped with a tower--will also be the first one worldwide.

The plant's components are going to be built in Italy to cover one-third of the power plant's value; that includesespecially the boiler, which represents one of the most delicate points in the system, the thermal cycle, and the regulatory mechanisms, which are going to be built by Ansaldo.

In addition to the Adrano Power Plant, Italy is participating in the construction of the tower-equipped power plan at Almeria in Spain with a capacity of 0.5 Mw which is being built as part of the program of the International Energy Agency.

Efforts over the Next 3 Years

(a) Over the next 3 years we do not believe that we should undertake any further initiative involving the construction of tower-equipped power plants in Italy.

On the other hand, participation in the two international projects at Adrano and Almeria should sufficiently guarantee the acquisition of experience in the operation of such power plants as well as in the handling of various management problems.

Together with an in-depth analysis, developed in the context of the bilateral agreement between Italy and the United States, these experiences will make it possible better to focus on the technical-economic prospects of this type of power plant and, at the same time, enhance the presence of Italian industry on the international market.

Italian industry however will be supported if other international initiatives should arise either on the multilateral level (EEC, AIE [International Energy Agency], UN) or on the bilateral level.

Looking at the countries of the Third World, the Foreign Ministry for this purpose, in coordination with the Ministry of Industry, will have to promote the construction of additional plants by Italian industry also through the fund managed through the Development Department.

(b) The technological development of the power-equipped plant components industry still requires public support. Some essential components--such as, for example, the heliostats--have not been given any attention in the recent past.

We therefore face the requirement for making sure--within the above-mentioned PNRE --to provide for adequately financed research efforts.

(D) Photovoltaic Conversion

The process of developing technologies for photovoltaic conversion is rapidly expanding all over the world under the impetus--especially in some countries--of a policy of public support for this nascent industry and a program for firming up the results of major research programs.

Italy must face the problem of the industrialization of photovoltaic technologies which can be accomplished over the next several years only with the support of an adequate public policy. This action must be aimed not only at supporting production and development initiatives but also at working out utilization strategies.

In another chapter of this Plan, we already emphasized that the contribution by 1990 in terms of electric energy produced can only be negligible compared to the need but the plan's objective for 1990 is to develop systems which permit the utilization of photovoltaic conversion in terms that will be economically competitive with other energy sources, at least in specific demand sectors.

This objective can be attained only through a strongly supported public effort--justified on the other hand by the country's shaky energy situation--in the sector of basic materials, production processes, and demonstration plants.

Efforts over the Next Three Years

Efforts contemplated for the first 3-year activity term in the various action sectors include the following:

(a) Efforts Dealing with Base Materials

For the next decade, the development of photovoltaic conversion technologies will essentially be based on silicon. The current situation in the electronics industry and the growing photovoltaic solar industry enable us to look forward to a shortage of material for photovoltaic activities, rather soon, which--in the absence of a public effort--will entail the risk of stopping Italy's industrial initiatives.

To start solving the problem of the availability of solar-grade silicon--between 1983 and 1984--at costs lower than current costs, the public effort will have to be concentrated on the kind of industrial initiative which will turn out to be most promising regarding the possibility of success both in technical-economic terms and in terms of time.

It seems moreover evident that the delays which have been accumulating in the Italian industry sector can be made up through agreements of an industrial type on the international level which will present the basic feature of guaranteeing the reduction of the time necessary for building a first commercial plant in Italy for the production of solar silicon.

At the same time, looking at the PNRE, it will be necessary further to develop or to initiate additional technological research efforts for the purpose of enabling Italian industry to analyze, in medium-range and long-range terms, the advisability of making production investments in alternate lines.

(b) Efforts Involving Production Processes

The need for enabling Italian industry to compete on the international level suggests that the public effort must be developed also to support technological innovation in production processes down the line from the production of silicon, in particular during the increase [enhancement] phase, during the silicon bar cutting phase, and in the manufacture of cells and panels.

Regarding the enhancement phase, it will be a good idea for the PNRE to indicate priorities as to the direction and destination of funds.

(c) Demonstration Effort

It is now obvious that the takeoff of industrial activities in the photovoltaic sector will be sustained through a multiannual public demand not so much for components but for complete systems.

The plan's objective is to simulate the demand in order, by the end of 1983, to reach a figure of 1 Mw/yr (peak power for flat photovoltaic panels).

The subdivision by utilization sectors, the operational instruments, and the financial resources through which we must attain the indicated level of "program gains" will be outlined every 3 years by the Ministry of Industry for the CIPE [Interministerial Committee for Economic Planning] which will issue the proper directive.

In addition to uses which are less significant from the energy viewpoint--such as those pertaining, for example, to telecommunications, cathode protection, and irrigation, the following three major applications will be given preference:

Supply of scattered houses with high heating costs (possibly in combination with wind energy and use of electric storage batteries);

Supply of smaller islands (in conjunction with other renewable sources plus electrical storage batteries);

Supply of domestic power grid through medium or large power plants or small local power plants.

The construction of plants for the above-mentioned sectors will have to be handled through collabortion between ENI, ENEL, and CNEN and with the maximum involvement of Italian industry for planning and construction of these facilities.

The suction effect deriving from public demands upon the "spontaneous" domestic demand as well as the growing requirements coming from third countries make us think that the program's implementation, within the dimensions indicated, can permit Italian industry to have an annual production capacity installed by 1990 which will be sufficient for the broadest application program.

3.5.2. Wind Energy

So far, the energy of the wind has not been utilized in terms of its real potential in a country such as Italy which, although known as one of the countries with a moderate wind situation, nevertheless offers interesting prospects for practical application. Compared to solar energy, wind energy offers the advantage of being available, like mechanical energy, on the shaft of an air motor and hence, if needed, of being easily convertible into electricity. This feature makes its development and future applications particularly attractive.

Italian industry has matured over the last 2 years in terms of its experience with small-sized air motors (up to a power output of 20 kw) which are particularly suitable for scattered electrical uses and for water pumping. Larger-sized units (with a capacity of 50 kw) are also being built, with advanced aerodynamic and mechanical characteristics.

Some programs, coordinated by ENEL and developed by domestic industry are now in progress:

(a) Construction and operation of a testing station for air motors and a wind power plant, located in Sardinia, consisting of ten medium-sized air motors (capacity 50 kw, rotor diameter 12 m);

(b) Launching of a vast research program aimed at the development of large-sized air motors (1-2 Mw);

(c) Experimentation with small-sized air motors (up to 20 kw), intended for supplying scattered [detached] homes or isolated communities with possible combination with other renewable sources;

(d) Wind science analysis of Italian territory in cooperation with other agencies and within the context of the PFE [Final Energy Project] of the CNR [National Research Council] so as to permit the identification of sites that would be best for the installation of air motors.

During the first half of 1980, the CNEN drafted a 5-year wind program whose major outlines are as follows:

Economic, institutional, social, and safety aspects of wind power systems;

Wind characteristics;

Industrial and technological development of small and medium air motors;

Testing station and technological development for small air motors (capacity less than 100 kw);

Restoration and development of very small-sized air motors (capacity up to 3 kw) for scattered uses.

Some activities have already been started in connection with the above-mentioned efforts.

Many of the similar activities planned or already carried out by ENEL and CNEN with industry and other national agencies will have to be concentrated in cooperation programs; in particular, the CNEN will participate in the previously mentioned program for the development of large-sized air motors.

Efforts over the Next 3 Years

(a) Regarding air motors of up to 50 kw--although the installation of these plants is a part of the incentive system provided for under DDL 655/80--we consider it necessary over the next 3 years, to guarantee an initial market for the manufacturing industry, as well as to acquire the necessary experience, to proceed to the following:

A demonstration program;

Rural electrification independent of the power grid;

Water pumping;

Supply of electric energy in conjunction with the power grid.

These plants will have to be combined partly with systems using other energy sources and including storage [of electric energy].

This plan will have to provide for the installation of no less than 2,000 kw for the various uses. For this purpose, ENI, ENEL, and CNEN, in collaboration with domestic industry, are going to have to submit an action plan to the Ministry of Industry.

To attain this objective, CNEN, ENEL, and industry consider it necessary, by 1983, to complete a technological testing and development station at a site with an adequate wind situation. Regarding the program's financing, it will be necessary to fall back on the budget funds of the two energy agencies.

(b) Concerning air motors with unit power output capacities of around 1 Mw, the ENEL, in its capacity as customer, and CNEN, in its capacity as industrial promoter, will have to launch the efforts necessary to make sure that at least a first experimental plant will be ready by the end of the next 3-year term. In this sector we figure on an international market which, over the next 5 years, is expected to reach a dimension of several hundreds of Mw per year; the Italian industry's delay can be made up if we immediately go into the development of a domestic capacity. The cost of this initiative, over the next 3-year period, can be taken care of within the ENEL and CNEN budgets.

(c) Finally it is necessary to continue and expand the collection of data on wind situations in Italy.

The CNEN is expecting to make a major contribution to this investigation which has already been started by the CNR in collaboration with ENEL and some domestic industrial establishments.

The survey's main objectives are as follows:

Determination of specific data in various localities (frequently geographically rather small areas) where wind intensity and force are of major dimensions;

Preparation of regional and national wind maps;

Analysis of wind's energy potential.

3.5.3. Exploitation of Biomasses for Biogas Production

Anaerobic digestion plants facilitate the production of biogas from biomass of vegetal and/or animal origin and can be inserted in most of the treatment units for urban sewage, as well as agribusiness and animal husbandry waste.

The gas which can be obtained from anaerobic digestion is a fuel mixture (60-65% CH_4, 30% CO_2, other gases) with a lower calorific power of about 5,500 kcal/Nm^3 [N--standard]); this power, used in the treatment plant itself, can in some cases make it possible to attain energy self-sufficiency. Regarding in particular urban sewage, anaerobic digestion is a technology which is immediately applicable and which has been considerably developed; it allows an investment return within a span of 10 years in plants serving a city of more than 50,000 inhabitants.

By way of indication, it is possible to get about 700 Nl/kg of treated organic substance from an anaerobic digestion plant processing urban waste and that corresponds to about 30 Nl/equivalent inhabitants per day.

In addition to the energy savings, the inclusion of anaerobic digestors also provides a series of other advantages:

The digested sludge is highly stabilized so that it can be used as fertilizer since it is rich in NPK [NPP--nitro-phosphate-potash]. This use has by no means negligible energy repercussions considering the fact that it is possible to replace equivalent chemical products with high energy intensity.

The sludge deriving from anaerobic digestion, compared to the sludge from aerobic digestion, is substantially more suitable in hygienic terms since the pathogenic microorganisms are destroyed.

Sludge from anaerobic digestion calls for a lesser energy requirement when it is processed down-line in desiccation plants.

Finally, concerning animal waste, current technology is still in the initial settling-down phase also due to the smaller dimensions of such units which are connected with agribusiness establishments that are widely scattered throughout the territory.

Efforts over the Next 3 Years

(a) Concerning the urban waste treatment units, it is necessary to introduce an adequate form of incentives for the installation of anaerobic digestors in existing plants and those under construction. This might be done within the budget allocations provided for by Law No 650, dated 24 December 1979, concerning the protection of water from contamination.

(b) It is necessary to launch a demonstration program regarding anaerobic digestion units connected with livestock industry and industrial plants which will also use substances dumped from processing facilities for the purpose of increasing the output of the plants and reducing the production costs.

(c) It is necessary to provide incentives for research and development activities relating to the application of new purification techniques, the selection of bacterial flora responsible for anaerobic fermentation for the purpose of:

Obtaining gases percentage-wise richer in methane;

Obtaining digested sludges with better fertilizing characteristics;

Supplying the digestor also with solid urban waste with organic matrix.

3.5.4. Fire Wood

Its contribution has been estimated at 1.1 Mtep [million tons of petroleum equivalent] in 1978.

On the basis of the wood mass accumulated and considering the ecological restrictions, we can assume a further contribution of 2 Mtep/year by 1990.

This figure does not include applications for cellulose, shavings, and construction work and is based on the use of both fast-growing copses for fire wood and waste from collection and processing of more valuable essences [essential oils].

Action To Be Taken

Promotion of new techniques for development and use for energy purposes.

This objective appears reasonable also in the light of efforts aimed at reviving fast-growing forestation projects as provided for in the law of 27 December 1977 and in the subsequent regional laws. The amount of money available is about 1 trillion for the decade.

This source is primarily for local consumption throughout the territory which, by the way, does not follow any specific sales channels.

Looking at it this way, we can expect this source to meet consumption and energy needs which have not yet been fully taken care of; this is why the contribution from such a source does not show up in Table 2.4/2, both in terms of current values and in estimated figures.

3.5.5. Hydroelectric Energy

Current Situation

In Italy, hydroelectric energy is being produced to the extent of three quarters by ENEL (in 1979, about 33 billion kwh), by city power companies (4.1 billion kwh), and to the extent of about 9 billions by other companies and in-house producers (Table 3.5.1.).

In order to make maximum possible use of domestic and renewable sources and in particular hydroelectric power, ENEL has further developed the results deriving from studies conducted to determine the further maximum contribution of that energy source to meeting electric energy needs.

From the results of these studies, presented at the Siena Conference in 1979, we deduce that a further maximum contribution from hydroelectric sources can be estimated at about 7.0 billions, apart from any considerations of an economic character, and this would require the construction of at least 62 plants (Table 3.5.2.).

Table 3.5./1. Gross Hydroelectric Energy Output in Italy from National Contributions according to Producer Category (Gwh)

	ENEL	City power companies	Other enter-prises	In-house producers	Total
1975	28,205	4,004	322	8,490	41,021
1976	27,603	3,686	307	7,580	39,176
1977	35,823	5,127	331	9,858	51,139
1978	32,966	4,079	311	8,135	45,491
1979	32,885	4,110	310	8,655	45,960

Note. Over the past 3 years, hydroelectric power output from natural sources was considerably greater than the figure relative to an average hydrological year.

Table 3.5./2. Further Contributions from Hydroelectric Power Plants not yet Authorized (Gwh)

	Average annual production capability	
	Total	Net undervoltages
1st group		
Competitive plants	4,311	3,456
2nd group		
Plants costing up to twice the cost of production from other sources	2,699	2,497
3rd group		
Plants costing more than twice the cost of production from other sources	1,187	1,107
	8,197	7,060

Concerning the economic characteristics, Table 18 shows the plants subdivided into three groups, respectively comprising the following:

(1) Currently competitive plants;

(2) Plants with costs of up to twice the cost of production from other sources;

(3) Plants with more than twice the cost of production from other sources.

To this group of plants, which have already been studied by ENEL, we might add other plants which have been examined only in a general way, with an average annual production capability totalling 1.3 billion kwh, as well as numerous very small new power plants or plants which can be rebuilt, for another total of 0.7 billion kwh.

This figure does not include one other possible contribution of about 2.0 billion kwh whose technical feasibility could derive from further studies conducted by ENEL, from proposals submitted by third parties, and from the use of rivers and streams in the Po and Adige plains which however pose difficult environmental problems.

After the Siena Conference, ENEL further developed the studies on hydroelectric plants already considered and expanded them by identifying other technically feasible plants with a total of about 0.7 billion kwh.

The November 1979 ENEL program also underscored the fact that it had first of all made every possible effort to put up those plants which, in addition to being technically possible, are also economically acceptable in the current energy market situation, that is to say, those belonging to the first group with a contribution of about 3.5 billion kwh.

We must however underscore the fact that, in the case of many of those plants, there is already considerable opposition, particularly tied to environmental protection, while the reaction concerning the other ones depends on the solution--by other organizations--of problems connected with the multiple use of water.

Considering these difficulties, an annual net production capability figure of about 1.5 billion kwh was estimated rather on the conservative side.

According to the 11 January 1980 CIPE directives--on whose basis ENEL programs are being updated--every effort will have to be made to increase the contribution from the hydroelectric source; the new contribution however--even assuming that the difficulties mentioned earlier are rapidly removed--would hardly exceed a total of 5-5.5 billion kwh/year by the end of the decade, also keeping in mind the considerable number of plants to be put up.

Finally, regarding the reactivation of very small hydroelectric power plants, we recall that, in the past, for reasons of uneconomical operation, a certain number of small hydroelectric power plants was closed down; in the new framework of the energy economy, six have been reactivated for a total contribution of about 17 million kwh and a start was made toward the reactivation of another 5 small power plants for a further contribution of about 14 million kwh. In 1979, ENEL decided to reactivate another 45 small power plants with an average total production capability of about 83 million kwh. The restoration will take place gradually during the years until 1984 and the new contribution will total something like 0.1 billion kwh.

Efforts over the Next 3 Years

During the coming 3-year period it will be necessary to launch a series of efforts both legislative and administrative.

They are as follows:

(a) Revision of the Single Law on Water and Electric Power Plants approved by Royal Decree No 1775 of 11 December 1933.

The revision of the Single Law is necessary in order to eliminate the contrasts currently existing between a standard going back to 1933--which furthermore is based on a regulation approved in 1920--and the subsequent laws which substantially amended the public water management system.

In particular, the legislation of the individual regions with special status--which obtained major autonomy in the matter of water control and electric power plants--is not readily reconcilable with the need for exploiting the nation's remaining water power resources.

A legislative initiative in that direction is contained in Bill No 811, submitted by the minister of public works to the Senate of the Republic.

(b) Lifting of Restrictions on Plants of up to 3,000 kw

Current legislation provides that electric energy generation, as produced, and independently of the power of the generator machines, is subject to the reservations ordered in favor of ENEL by Article 1 of Law No 1643 dated 6 December 1962.

Only some categories of producers (city power companies, in-house producers, small combined producers and distributors) are allowed to produce electric energy after getting the O.K. from MICA [Ministry of Industry, Commerce, and Crafts] which must mandatorily obtain an opinion from the ENEL.

Considering the fact that, after this O.K. has been obtained, the requestors must follow the procedure necessary for getting a water diversion permit, in order to facilitate the construction of these plants, one could lift the restriction on the construction of hydroelectric power plants of less than 3,000 kw by eliminating the requirement for the O.K. from MICA and allowing also private persons or companies to build them.

The legislative initiative in that direction is contained in Article 6, Bill No 655, submitted to the Senate by the Ministry of Industry, calling only for the report to the ENEL.

(c) Government Financing for Construction, Boosting, and Reactivation of Hydroelectric Power Plants.

Financing can be handled in the following ways:

Contributions from capital account;

Capital allocations based on loans;

Award of contribution, requiring interest payments.

Initiatives in that direction are contained in the bill mentioned above.

(d) Reduction, by Regions, of Administrative Processing Times Relative to Release of Authorization for Construction, Boosting, and Reactivation of Hydroelectric Power Plants

The authorization for actual work performance is given by the regions only after all of the questions in the various forms have been filled out regarding the construction, boosting and reactivation of hydroelectric power plants.

To speed this procedure up, it is necessary to issue instructions to the regions and to the local public works supervisor's offices to the effect that--so long as there is no opposition from damaged third parties or parties interested in the construction of the plant--that they immediately release authorization for the start of work.

3.5.6. Geothermal Energy

Current Situation

Activities involving the exploration and cultivation of geothermal resources are being carried out autonomously by ENEL in the territories of the four Tuscan provinces of Grosseto, Livorno, Pisa, and Siena and by the joint venture involving ENEL and AGIP [National Italian Oil Company] by virtue of the 23 December 1975 CIPE resolution for the remainder of Italian territory.

Research activities aimed at the acquisition of new technological knowledge in the geothermal sector are being carried out not only by ENEL and AGIP but also by CNR (through the International Institute of Geothermal Research and the Geothermal energy subproject of the Complete Energy Project) as well as some university institutes.

The Italian peninsula is characterized by a hot Tyrrhenian strip, consisting of recent volcanic base formations and a cold strip comprising a series of sedimentary basins extending from the Po Plain to the Bradanic (Puglia) and Caltanissetta (Sicily) rift valleys.

Other hot areas are in the volcanic arc of the Aeolian Islands, the rifts in Sardinia and the Sicilian Channel, and the volcanoes of Vulture and Mt Etna.

Concerning the estimate of the geothermal potential available in Italy, the figures provided by ENEL indicate a theoretical power on the order of 2,000 MTU for geothermal reserves suitable for electric energy generation (that is to say, relative to the geothermal fluids which can be extracted at temperatures higher than 130° C).

But considering the actual conditions under which we operate (in particular, the uncertainties regarding the nature of fluids brought to the surface, the environmental restrictions, and the small surface areas involved), it is a good idea--for the purpose of drafting industrial objectives--to operate as if the maximum power obtainable in Italy from these reserves would be about 1,000 Mtu for a period of 50 years.

Right now, 440 MTU are installed in the basins of Tuscany and they produce annually about 2.5 billion kwh, corresponding to 1.6 percent of the nation's electric power output and 0.4 percent of Italy's energy needs.

Low-enthalpy geothermal reserves are much larger (in other words, involving geothermal fluids which can be extracted at temperatures below 130° C) and they can be used for heating purposes.

But it must be kept in mind that the basic requirements of a heat deposit to be used for heating purposes is that it must be located near the potential user.

As a matter of fact, contrary to electric energy, heat is difficult to transfer over long distances and even for short-distance transmission, the cost of transfer is particularly high.

In any case, it must be stressed that geothermal reserves are territorially distributed in a very disparate manner: we have the biggest concentration as a matter of fac in the Tuscany-Lazio-Campania pre-Appenninic strip in which we can estimate to find more than 90 percent of the total available geothermal resources in national territory.

Within this strip, the areas most suited from the geothermal viewpoint are located as follows: in the zones of Larderello, Radicondoli-Trovale and Monte Amiata, in Tuscany; in the Volsini Mountains, the Sabatini Mountains, and the Alban Hills in Lazio; in the Flegreo-Ischitana and the Vesuvian in Campania.

In the Abano Basin, thermal waters are used to heat 120 hotels for a volume equivalent to 8,000 rooms, while at Lardarello the people are using endogenous steam waste to heat 350,000 m^3 of workshops, homes, and community facilities equivalent to a total 1,750 rooms [housing units].

The Abano and Larderello initiatives alone permit an annual heat gas-oil saving estimated at more than 33,000 t.

Looking at the energy balance sheets for the past several years, geothermal energy represents about 2 percent of the energy output from domestic sources, facilitating a saving of about a million tons of petroleum per year. The predominant portion of that quantity comes from high-enthalpy fluids for the production of electricity while the use of low-temperature and medium-temperature sources is still marginal.

Objective

On the basis of the estimate of operational reserves (down to a depth of 3,000 m), we figure that the maximum supply capacity of the entire Italian electrical geothermal system is something like, 100 MTU or 2.5-3 times the current volume.

We anticipate that electricity generation from geothermal sources over the next 5 years will exceed 3 billion kwh/yr to reach a figure of 4 billion kwh/yr in 1990.

This increase also could turn out to be greater if it should be possible to start production with deep hydrothermal systems (beyond 3,000 m) for which a major commitment in terms of exploration and prospecting over the next 5 years has been planned; at the same time we cannot yet foresee what contribution the "not dry rock" systems could make because studies in this field are still in their beginnings and there are many problems to be solved (stimulation of hydrothermal systems, exploitation of techniques, etc.).

The objective determined here of course is contingent upon a powerful impetus for geothermal activities and the solution of many institutional problems.

It must be kept in mind that the technical time frame necessary for development of geothermal-electrical projects from the procurement of the mining permit all the way to the initial electrical power output by stationary plants would be on the order of at least 7-8 years in the case of prevailing steam systems and can attain

or exceed 8-10 years in the case of water systems with a high thermal [heat] content.

Regarding the thermal uses from low-enthalpy and medium-enthalpy thermal springs (? - 150° C), it is difficult to set any objectives in the absence of a complete survey on the existing potential and also in relation to the possible uses. But it is believed that--with an existing potential already ascertained at several Gw per year--we could, over the next decade, build plants to exploit geothermal fluids with a total savings capacity estimated at 100,000-300,000 tep [tons of petroleum equivalent] per year. In this utilization sector, geothermal energy is a source of local use which is very difficult to transport and which therefore can be used within a maximum radius of just a few score kilometers if the temperatures and the ranges so permit.

For these fluids, current forms of utilization involve direct heat uses, as well as employment in the industrial, civilian, agricultural, and livestock sectors.

Interesting prospects open up regarding combination with heat pumps in order to increase the temperature of the geothermal heat.

Action To Be Taken

(a) Utilization of Geothermal Sources To Produce Electric Energy

The previously indicated objective of achieving an output of 4 billion kwh in 1980 is covered in the program of ENEL and AGIP.

To attain this objective, the two agencies estimate that it would be necessary to have at least a dozen probes available for exploration, development, and maintenance operations.

The operations carried out autonomously by ENEL primarily involve the zones of Larderello, Travale-Radicondoli, Monte Amiata, Torre Alfina, Cesano, Orciatico, Roccastrada.

Currently, 361 Mw are installed in the Larderello zone; activities in progress and planned involve the following: the drilling of intermediate and marginal areas in the production field; the return, into the subsoil, of ebb waters and the stimulation of sterile wells.

In the Travale-Radicondoli zone, where 48 Mw are currently installed operations will be aimed at the utilizaton of Radicondoli well which was tapped recently as well as the completion of additional drillings.

In the zone of Monte Amiata, where 22 Mw are currently installed, activities planned are directed at the use of Piancastagnaio 26 well which was recently reopened as well as the completion of new drillings.

In the Torre Alfina area, where deep exploration began in 1973, operations are aimed at the study and analysis of possible utilization cycles of recovered fluids of a corrosive and crust-forming nature.

In the Cesano zone, characterized by high-salinity fluids, activities are aimed at extensive experimentation with active wells and, simultaneously, the drilling of new wells.

In the Roccastrada and Orciatico zones, activities call for the completion of surface exploration and hence the start of deep drilling.

Activities carried out by the ENEL-AGIP joint venture (with ENEL as the operator) primarily involve the zones of Latera Lake Patria, Ottaviano, the Sabatini Mountains, the Alban Hills, and the Cimini Mountains.

In the Latera zone, where "Latera 2" well turned out to be productive, operations are aimed at experimentation with the fluid discovered and the development of the area around the well itself.

In the Lake Patria zone (operator: AGIP), where exploration began in 1978, the wells drilled so far are all productive right now; in another area, north of Pozzuoli, the S. Vito 1 well has been completed. Activities are aimed experimentation with recovered fluids and the drilling of additional wells in the Mofete zone and possibly also in the Pozzuoli zone.

Activities in the zones of the Sabantini Mountains and the Alban Hills (operator: ENEL), the Cimini Moutains and the Sabatini Mountains (operator: AGIP) are aimed at the completion of surface explorations and the start of heat exploration.

We can also anticipate that, during the next decade, consideration will be given to the first surface surveys in other parts of Italy which reveal signs favorable for the purposes of geothermal prospecting, such as Roccamonfina, Ischia, Vulture, the Aeolian Islands, and eastern Sicily.

(b) Utilization of Geothermal Sources for Heating Purposes

The previously indicated objective of finding geothermal fluids for heating uses up to a figure corresponding to 100,000-300,000 tep/year does not depend so much on the availability of low-temperature geothermal springs but rather on local usability factors and on the market economy for the heat substituting source.

Among projects currently under way we might above all mention the AGIP project at S. Donato Milanese which calls for finding medium-temperature and low-temperature fluids for the heating and air conditioning of residential housing and office space totaling 400,000 m^2; the project of ENEL at Radicondoli involving the use of steam, which cannot be used for electrical purposes, in the hothouses managed by a local company, as well as the Amiata Project according to which the heat generated by the geothermal-electrical power plant of the ENEL [illegible in photostat] at Piancastagnaio, equipped for the combined production of electric energy and heat, will be used by ENI to heat 50 hectares of hothouses and for other important initiatives launched by the ENI in the Amiata Administrative District.

In other parts of Italy, the ENEL-AGIP joint venture is promoting activities at this time aimed primarily at the discovery of fluids for heating uses. Among these we might mention the zone of Civitavecchia where the existence of low-temperature fluids

(50° C) has been ascertained at depths from a few centimeters to several meters, which could be used for heating the fuel oil of the Torvaldaliga Power Plant; the zone of Ferrara where the presence of hot water was discovered (100° C) at a depth of 2,000 m, which could be used in agriculture and for heating interior spaces; the zone of Vicenza where a well drilled for petroleum prospecting revealed hot water at 70° C.

Thermal uses are also planned in many of the zones mentioned earlier in connection with utilization for electric energy generation.

This is particularly true of the zones of Cesano and the Alban Hills where market surveys are currently in progress on heat requirements for domestic and industrial uses.

Cost of Operations

By way of indications as to the cost of the operations planned in the geothermal sector, we might recall that the ENEL 5-year plan calls for a commitment (at 1980 prices) of 370 billion lire while the AGIP program calls for allocations of 150 billion lire.

Instruments

To be able to obtain the above-indicated objectives, new geothermal legislation is absolutely necessary; they should facilitate the procurement of authorizations for mining operations and in particular for the reinjections of fluids today hindered by inadequate standards.

It is also necessary for the new legislation to clarify the role to be played by the local entities and in particular the regions regarding thermal uses of geothermal fluids.

In this connection it is considered advisable to provide for forms of economic incentives for the use of low-enthalpy geothermal springs for domestic heating or in agricultural and industrial uses.

To attain the objectives proposed, it is also necesary to improve technological and scientific knowledge in all sectors of geothermia.

This is why it is indispensable for the PNRE, currently in the drafting phase, to spell out the principal prospecting operations and to provide for strong support for those activities.

3.5.7. Substitute Fuel

The use of mixtures of gasoline with alcohol, particularly with methanol, can contribute to holding down the consumption of petroleum products for automotive transportation.

Extensive laboratory research and limited testing of motor vehicles with the methanol-gasoline mixture yielded the following results:

(a) The employment of the mixture calls for slight modifications in engines, which increase along with the increase in the concentration of methanol; the specific consumption of the mixture increases slightly with respect to the use of gasoline alone but in any case the increase in consumption is less than what the low caloric power of methanol--about half of that of gasoline--could lead us to anticipate.

(b) By virtue of its excellent octane characteristics, 1 t of methanol is equivalent to more than 1 t of crude; we therefore understand that the economic value of methanol is in line with that of crude.

(c) Limited testing with motor vehicles conducted so far demonstrated that, from the driving viewpoint, problems connected with the use of methanol (vapor lock, cold-start, materials strength) can be solved.

These motor vehicle tests were conducted within the PFE of the CNR, using 12 vehicles (including Fiat and Alfa Romeo models) with normal practice runs on 20,000-40,000 km of highway and with methyl fuel and gasoline supply in ratios of 20-80 percent.

(d) In the current state, the fuel supply network is not adapted to the distribution of methanol-gasoline mixtures since it reveals a water content incompatible with the stability of the mixture; on the other hand, the presence of water so far has not been a problem since hydrocarbons are practically immissible into water.

To be able to guarantee the stability of the mixture, we can identify the following combined efforts:

Insertion, into methanol-gasoline mixtures, of a higher alcohol which would increase its tolerance to water;

Improvement of gas station tanks and modifications in storage tanks in refineries and fuel dumps;

Preparation of mixture as far down-line as possible in the distribution network; right now it seems that the best preparation place, from the viewpoint of reliability and cost, is close to the tank truck loading depots (preparation near service stations on the other hand looks very expensive).

Although these actions appear to be relatively inexpensive and feasible, we still do not have any experimental proof that they can with sufficient reliability guarantee the necessary constancy of the products. It is therefore indispensable to conduct motor vehicle fleet testing based on the current and properly modified distribution network.

(e) Sufficient quantities of methanol and higher alcohols are currently not available on the world market for large-scale employment of methanol-gasoline mixtures in Italy; but even if we want to replace only 10 percent of the gasoline, we would have to have about 1 million t of methanol and 0.5 million t of higher alcohol.

The use of the mixture will have a diversification function; imported methanol will naturally have to be produced from coal or natural gas from peripheral deposits in the producer countries.

It follows from this briefly sketched outline that the employment of the methanol-gasoline mixture is feasible, provided that:

It has been demonstrated--through testing of motor vehicles, supported by a modified cross-section of the current fuel network--that the distribution of the mixture is feasible with sufficient reliability and with adaptation costs that will not be too high;

The necessary quantities of methanol and higher alcohols are guaranteed at the right time.

In this connection we note that methanol could be produced from Sulcis coal while the other higher alcohols could be obtained from the C fractions of LPG which will be imported into Italy over the next several years. Alternatively, one could use a methyl fuel production process (mixture of methanol and higher alcohols) now being tested on a pilot scale within the ENI group.

As higher alcohol one could also use ethanol from biomasses (among other things, wood, cellulose waste, etc.) although it--among all of the higher alcohols--is less effective in increasing tolerance to water and involves higher production costs.

In any case, even if a decision were to be made right away, the sale of the methanol-gasoline mixture could not take off before 4-5 years on account of the nonavailability of methanol and need for guaranteeing the distribution of the mixture throughout national territory.

Nevertheless, in order not further to postpone the time for the introduction of this new fuel, it is necessary right now to launch the following activity with the necessary coordination on the European level:

As quickly as possible look into the adaptability of the current fuel network in terms of the distribution of the mixture and the pertinent costs;

Identify methanol and higher alcohol supply sources;

Study and define a methanol receiving and distribution network;

Provide incentives for the construction modifications necessary for making cars that can use methanol-gasoline mixtures; efforts must be coordinated with the production companies.

These activities, which must be started early, could lead to the replacement of about 0.5 million t of crude around 1985.

We finally observe that the layout of the methanol-containing fuel distribution network has meaning also in the remote prospects of using synthetic fuels derived

from coal or other fissile [sic; fossil, mineral?] sources since the latter reveal reduced octane characteristics; the use of a high-octane component, such as methanol, would however eliminate the need for further processing of synthetic fuels.

As an alternative to the methanol-gasoline mixture, we could use an ethanol-gasoline mixture; in that we would reduce the problem connected with the presence of water in the distribution circuit but on the other hand we would run into a higher cost for the mixture since the price of ethanol is at least twice the price of methanol.

In any case, considering the possibility of employing ethanol as higher alcohol in methanol-gasoline mixtures, it is a good idea to analyze the domestic ethanol production potential and the possibilities of importing from third countries.

Regarding domestic production, we will have to keep in mind the results of the feasibility study sponsored by the CNR within the PFE.

A research, development, and demonstration effort could be made not only in Italy but also in countries that are potential producers of raw materials through suitable cooperation agreements.

We are also looking into the increased use of methane gas for private and public purposes (buses, taxi cabs, railroad traction) not only in regions already serviced but also in those, especially in the South, which will get the benefit of gas imported from Algeria. This would permit the maintenance of an alternate supply system and hence give us greater flexibility.

The attainment of this objective calls for the development of means of employing methane under optimum yield and safety conditions, the fixing of adequate prices for gas which will be supplied for this purpose, and a system of incentives for the users.

The anticipated greater availability of imported LPG could contribute not only to meeting the industrial energy requirement quotas (petrochemistry) but also civilian needs with greater transportation system supply flexibility coupled with preferential destination of supplies and combined with specialized motor pools (taxi cabs, motor pools of public administrations).

3.5.8. Upgrading and Coordination of New Energy Technologies

1. It is evidently necessary to make sure that all components of the new energy systems, which make use of renewable sources or which employ conventional sources in a more efficient manner, will be in line with the criteria of reliability (duration, services rendered, etc.) for the purpose of safeguarding not only the users but also specified producers.

On the other hand, the rapid development of technologies--except for a few cases--so far has not permitted the protection of a precise technical standard which is going to have to be developed as time goes on. On an international level likewise, the standardization situation has not yet been clearly spelled out although noteworthy development has already been attained in the United States.

2. The implementation of demonstration programs in the various sectors of practical application and the development of initiatives aimed at the substitution of outdated technologies with other initiatives (as is the case with solar or mixed water heaters) require us parallel to this to develop a series of initiatives which will facilitate product quality control, although with methodologies still being developed.

For the first 3-year period of practical application, the plan provides for the following:

(a) Study and perfection of a national standard. For this purpose the initiative already launched by the CNR and the ENI will have to be pushed and will have to be coordinated with similar initiatives within the Community.

(b) The Ministry of Industry will delegate coordination and upgrading activities to suitable agencies or research centers.

For this purpose, and in particular regarding coordination and control of plants and complex systems, the minister of industry will submit a suitable bill designed to assign the authority, earlier given to the National Association for Combustion Control, to other domestic agencies and organizations instead.

The upgrading effort on the Community level among other things will have to include the following:

Spefications by the builder, of the technical-construction characteristics of the system components (blueprints, materials, tolerances, yields, guarantees, etc.);

Control, by delegated organizations, over the meeting of characteristics declared by the builder, on the basis of coordination norms which, among other things, must fix minimum acceptability standards;

Controls, at the plant, by delegated organizations, similar to the provisions contained in Law No 373 and the implementation regulations;

Labeling of equipment to let users know all data needed for correct and efficient use of equipment.

The upgrading and coordination activities furthermore will comply with the following priority scale:

New equipment for which no valid terms of comparison have as yet been worked out in connection with the analysis of acceptable reliability (solar collectors, heat pumps, wind systems, etc.);

Widely-used equipment (for example, electrical household appliances) for which we can also use the standards already existing in other countries in order, among other things, to facilitate the export of Italian products.

Table 3.5./3. Renewable Sources and Alternate Fuels--Review of Investments and Allocations for Incentives
(Billions of Lire, 1980)

	1981-83	1984-90	1981-90
Solar energy			
Low temperature	200 (1)	800 (1)	1,000 (1)
Concentration distribution systems	10	--	--
Power-equipped plants	--	--	
Photovoltaic conversion	50	125 (2)	210
Wind energy	5		
Biogas from biomass	20 (3)		
Wood energy	--	--	--
Hydroelectric energy	1,200 (4)	3,900 (4)	5,100 (4)
Geothermal energy (thermal and electrical uses)	300 (4)	700 (4)	1,000 (4)
Alternate fuels	40	150	190
Total	1,825	5,675	7,500

(1) They represent a part of the incentives provided for savings and efficient use of energy in the civilian and residential housing sectors, Table 4.1/1/4, relative to low-temperature applications of solar energy only.
(2) The state of the art of this technology and its application as well as the uncertainty regarding the development level to be reached during the 3-year period of 1981-1983 do not permit a final analysis of the entities of allocations necessary after 1983. The figure given however can be used for guidance.
(3) These allocations for incentives will be suitably tied in with actions already planned in support of the livestock industry under Law No 984, dated 27 December 1977.
(4) Figures shown refer to investments in sector.

[16 Jan 81, pp 45-52]

[Text] Energy Plan--V. In this issue we record the first part of Chapter IV, "Policies and Actions To Be Undertaken in the Field of Efficient Energy Use" under the National Energy Plan.

4.1. Civilian and Residential Use Sector

4.1.1. Energy Consumption and Size of Plant Inventory

Energy consumption in the national housing sector amounts to about 31 Mtep (year 1979) of which 23 Mtep go for heating, about 3 Mtep for the production of hot water for domestic uses, about 1 Mtep for electrical household applicances and lighting, about 2 Mtep for cooking.

It is estimated that about 80 percent of the energy is consumed more specifically by the domestic sector and about 20 percent by the tertiary sector (commerce, the crafts, and government).

More particularly, the energy consumed in the domestic sector is used to the extent of 74 percent for heating, 10 percent for the production of hot water for sanitary uses, 8 percent for cooking, and 8 percent for specific electrical uses.

In the tertiary sector, the heating volume (about 75 percent) is almost the same as in the domestic sector whereas other uses differ considerably; hot water production for sanitary uses requires 3 percent of the energy consumed and specific electrical uses take up 22 percent.

The size of the residential housing inventory--with relation to the condition--and the heating plant inventory are illustrated in tables 4.1/1/ 4.1/2; and 4.1/3).

The consumption sector we are looking into here therefore is highly diversified and is characterized by the presence of millions of plants and units which combine to constitute a significant fraction of energy consumption and which on the other hand are managed by the user with absolutely nonentrepreneurial criteria. This causes considerable waste of energy and at the same time the final user cannot rely on efficient service either.

It must furthermore be kept in mind that, as established by recent surveys, individual forms of behavior, tied to strong habits, considerably influence the regulation of energy flow.

The progressive reduction in the use of fuels derived from petroleum calls for the launching either of further initiatives, in addition to those already launched in the recent past, or combination with the contribution of renewable sources as well as conversion of sources of more efficient energy such as, for example, the combined production of energy and heat.

In recent times, the following conditions materialized:

Rather high energy source prices with prospects for further increases in real terms;

Variation in the rates of change between primary energy sources and technologies in the sector of civilian uses so as to point up the advisability of acting in the entire existing housing inventory with a view to optimizing once again the use of the various factors necessary in meeting the user's needs.

Today, users allocate a certain share (equal to 4 percent of the national income) for the purpose of meeting environmental comfort needs and, in the future, the expansion of housing construction will only lead to an increase in the fuel demand, not only because of an increase in housing units and plants, but also because of a tendency toward a greater and better distribution of the standard of living.

Table 4.1/1. Size of Housing Inventory

1 Tipologie edilizie	2 Edifici (in migliaia)				
	3 Nord/Ovest	4 Nord/Est	5 Centro	6 Sud/Isole	Total
Monofamiliari 7	880	1.167	807	1.706	4.557
Bifamiliari 8	341	271	262	609	1.483
Plurifamiliari 9	273	171	214	387	1.045
Pluripiano 10	134	62	48	68	312
Total	1.628	1.671	1.331	2.767	7.397

Key: 1--Types of housing units; 2--Buildings (in thousands); 3--Northwest; 4--Northeast; 5--Center; 6--South, islands; 7--Single-family; 8--Two-family; 9--Multi-family; 10--Multi-story.

Table 4.1/2. Condition of Housing Inventory

1 Tipologie edilizie	2 Edifici		3 Stato di conservazione in %				
			4 Anteriore al 1966			5 Posteriore al 1965	
	6 In Migl	%	7 Buono	8 Medio	9 Cattivo	10 Costruiti	11 Ristrutturati
Monofam 12	4.557	61.6	28	4	44	9	15
Bifam 13	1.483	20.0	18	24	26	21	10
Plurifam 14	1.045	14.2	15	20	42	13	10
Pluripiano 15	312	4.2	20	21	36	20	3

Key: 1--Types of housing units; 2--Buildings; 3--Condition in percent symbol; 4--Prior to 1976; 5--After 1965 [sic]; 6--In thousands; 7--Good; 8--Medium; 9--Poor; 10--Built; 11--Rebuilt; 12--Single-family; 13--Two-family; 14--Multi-family; 15--Multi-story.

Table 4.1/3. Characteristics of Heating Plants

Aree geografiche 1	2 Edifici con impianti (in migliaia)				
	3 Autonomi	4 Centralizz.	5 Stufe	6 Assenti	Totale
Nord — Ovest 7	569	358	650	41	1.628
Nord — Est 8	692	120	831	28	1.671
Centro 9	289	152	729	161	1.331
Sud — Isole 10	349	159	1.757	502	2.767
Total	**1.899**	**799**	**3.967**	**732**	**7.397**

Key: 1--Geographic areas; 2--Buildings with heating plants (in thousands); 3--Autonomous; 4--Centralized; 5--Stoves; 6--Missing [none]; 7--Northwest; 8--Northeast; 9--Center; 10--South, islands.
Based on data supplied by ISTAT [Central Statistics Institute] and CREME [Southern Loan Fund?].

4.1.2. Actions To Be Launched During the Next 3-Year Term

In meeting future energy demands in the civilian use sector we can launch and justify real processes of transformation aimed at the type of supply involved.

On the supply side as a matter of fact we anticipate the following:

Utilization of renewable sources, such as solar energy, geothermal energy, fire wood, and waste;

Utilization of waste heat;

Utilization of combined electrical energy and heat production.

On the demand side we anticipate the following:

Action aimed at the housing construction envelope in order to reduce the volume of heat necessary to provide a certain temperature;

Action aimed at plants designed to guarantee the improvement of efficiency through industrial-style management;

Optimization of electrical household appliances.

It is therefore possible to arrange for a series of steps using industrial technologies that are now ready and that would make it possible to eliminate waste, to improve the efficiency of traditional energy conversion, and to use renewable energies in order to improve the method of using the "asset called energy."

A. Heating Service

One of the action possibilities here would be, on the part of the government, to promote the development of a supply of services which would progressively take the place of conventional fuel supply.

In that direction we can look forward to the introduction, into Law 655/80, now being discussed in parliament, of a suitable amendment which would permit the collection of the contribution [tax] alternately either from building owners or from energy service suppliers.

The dissemination of the energy service in the management of the heating system is considered an essential element in the policies for providing incentives for energy savings in housing.

In this connection, the Ministry of Industry will have to submit to the CIPE a 3-year action program designed to guarantee no less than 50,000 heat service supply contracts offered to users by energy operators.

The contracts will have to guarantee the users the kind of heat comfort levels provided for within the limitations of Law 373/66, maintenance of expenditures at minimum possible levels, and above all priority in service continuity.

The incentives provided for in DDL 655/80 could be made available to energy operators in the private sector each of whom would take care of a certain number of heat supply contracts amounting to no less than 500 by 1983 which would enable us to save at least one-third of the quantity of petroleum consumed in 1979.

B. Standards in Law 373 on Existing Building Heating Systems

Compliance with the standards provided for in Law 373 (regarding a maximum temperature of 20° C, adoption of automatic regulation taking into account outside temperature, periodic maintenance work on the plant) already makes a noteworthy contribution. But the technical instruments necessary for assisting the communities in the correct implementation of the law--by providing for further inspections even if only on a random sampling base--must be further boosted partly also among the regions.

The biggest energy savings in this sector however can be achieved through insulation of buildings (installation of storm windows in existing window frames, heat insulation of roofs, of vertical outside walls, etc.) and improvements in heat supply plants (heat regulation, programmed maintenance, remodeling of plants, temperature regulation for individual environments, heat meter installation, etc.).

In this context it will be necessary to launch suitable efforts aimed at improving materials and components.

These efforts will have to be accomplished both through the system of incentives for private operators, already provided for under DDL 655/80, and within the context of energy operations supply.

By way of demonstration, the following actions are anticipated for the next 3 years under the plan:

(a) Reduction by at least 10 percent of the energy consumption in all buildings which house ministries through specific steps. Upon request, the Ministry of Industry will have to supply technical assistance (also through ENI and ENEL) to other government agencies by surveying and analyzing the results.

(b) Reduction by at least 10 percent of consumption in buildings used by regional governments. For this purpose, the regions will communicate to the Ministry of Industry the overall project, the time frame, and the anticipated energy savings. The CNEN will have to survey and analyze the results.

(c) Reduction of at least 10 percent in consumption in all buildings that house chambers of commerce and the outlying offices of central government agencies, banking institutions and insurance companies, community offices in communities with more than 50,000 inhabitants.

(d) Reduction by at least 10 percent of energy consumption in buildings connected with hospitals.

For this purpose, the regions will have to issue the proper directives and make the necessary sums available.

The results of the studies conducted within the Final Energy Project of the CNR indicate that this is the most promising initiative even in short-range terms with a view to achieving important savings results; it turns out to be technically complex however and at least during the initial phase will call for maximum assistance from energy agencies. The ENI, ENEL, and CNEN will therefore have to provide every technical assistance requested also in collaboration with industries, specialized operators, and university institutes operating on the local level.

The three significant energy agencies will have to keep the Ministry of Industry informed on the development of this program.

(c) Beyond the sectors already indicated, it is obviously important to make sure that services in public office buildings be directed to take all possible steps in order to hold energy consumption down.

It is furthermore important to make sure that specific initiatives are made to materialize during the first 3 years of this Plan in view of the great trend-setting significance on a nationwide scale which such initiatives have. With all of the actions covered here in B and involving about 1 million buildings, we can achieve an energy saving equivalent to about 2.3 Mtep/year in 1983.

C. Air Conditioning of New Buildings

(a) Concerning new buildings, the complete application of the standards provided for in Law 373/76 will lead to a saving of about 0.2 Mtep/year.

This however is the sector where it is possible to introduce new planning and construction methodology, such as the employment of more advanced systems from the technological viewpoint which can also include the use of renewable sources.

This is why it is considered essential that a vast demonstration program be carried out during the first 3-year term of plan implementation.

The demonstration effort must reveal the characteristics of maximum diversification both in terms of customers serviced and in terms of techniques involving employment, interested operators, and geographic distribution.

This presupposes that the demonstration effort be prolonged in terms of time, that it be increasingly managed also on the local level and that it be coordinated regarding objectives and capacities to disseminate on the national level the possibilities and results through timely information drives.

(a) [sic] School Building Construction

Every region will have to indicate to the Ministry of Public Education the school buildings that are going to have to be built over the next 3 years with high energy-saving techniques. The secretariat of the Permanent Energy Committee will examine the projects, evaluate the technical validity of solutions proposed by comparing them to the possible effects on anticipated energy consumption and it will then be able to suggest possible improvements and modifications.

The higher construction costs can be covered either by funds allocated for experimental school building construction or by funds provided for under DDL 655/80.

(b) Hospital Construction

Every region shall indicate to the Ministry of Health those hospitals which are going to be built over the next 3 years with high energy-saving techniques.

The secretariat of the Permanent Energy Committee will examine the projects, the technical validity of solutions proposed by comparing the possible effects on anticipated energy consumption and it can then suggest possible improvements and modifications.

The possibly higher cost of projects considered to be valid will have to be covered by the allocations provided for under DDL 655/80.

(c) Miscellaneous Public Housing Construction

In the case of new public housing construction, the government agencies, the regions and the communities with more than 50,000 inhabitants shall, over the next 3 years, make sure that at least one-third of the buildings, for which planning must yet be started, will be built according to high energy-savings criteria, in any case, with insulation superior to the type provided for under Law 373, according to Table B, DDL 655/80.

In this case likewise, the Ministry of Industry--as part of the coordination of energy agencies--will upon request furnish the necessary technical assistance.

Financing the higher costs which this initiative will imply should be obtained for the most part from budget funds of the regional and community governments but for projects of particular demonstrative significance it shall be possible to use the funding provided for under DDL 655/80.

One must furthermore keep in mind the existence of the EEC demonstration project which could furnish further financial support.

(d) Subsidized Housing Construction

By subsidized housing we mean residential housing programed and subsizied by the government under the "Ten-Year Housing Plan" (Law 457/78). During the first 3 years of activities under the plan it may be possible to start planning and construction using high energy-saving techniques in at least three housing construction complexes for every Italian region.

For this purpose, the regions--through the autonomous low-cost housing institutes--shall submit to the CER the projects which they intend to launch and on whose basis the financial requirements will be determined so as to cover the higher costs, to be secured within the scope of the experimentation funds provided for under 457/78.

The Ministry of Public Works will furthermore send the projects to the Ministry of Industry which, through the secretariat of the Permanent Energy Committee, will furnish its own technical opinion.

D. Production of Hot Water for Sanitary Uses

The use of solar energy for the production of hot water looks promising but must be analyzed not only in relation to criteria of economic convenience but also in relation to the technical possibility of installing, on existing buildings, a collecting surface which will be correctly oriented and which will be sufficiently large to cover a significant portion of the energy needs. The development of solar energy utilization can be achieved also through the installation of solar water heating facilities normally included to guarantee the necessary continuity of service with gaseous fuels or with electrical energy. Priority must be given where possible to combination with natural gas.

The ENI, together with the gas distribution companies, and the ENEL will have to take steps to work out an action plan for the installation of integrated water heating plants for the purpose of exceeding a figure of 1 million units by 1990.

In particular, the ENEL will have to work out--in collaboration with industry--an action plan for the installation of no less than 200,000 units during the next 3 years and for that purpose the Ministry of Industry shall propose an amendment to DDL 655/80.

Through its own gas distributing companies and in collaboration with industry, ENI is called upon to draft an initial 3-year action plan designed, in addition to gas, also to furnish a mixed gas-solar system for the production of utility water with particular reference to the methane utilization process for the South.

E. Materialization of Mandatory Electrical Uses

The energy saving potential attainable through the correct use of the domestic and tertiary sector of equipment and electrical household appliances featuring improved-characteristics and properly calibrated dimensions is noteworthy and can be figured at about 8 Twh (1.8 Mtep in terms of primary energy).

Domestic industry is moving toward the production of more energy-efficient electrical household appliances. The current conversion process however is too slow and will be speeded up through the funds made available under Law No 675/78.

During the next 3 years, ENEL will have to arrange and implement, in cooperation with domestic industry, a first series of demonstration efforts to analyze the costs of the conversion operation which will involve not only the manufacturing industry in this sector but also the methods of employment connected with individual ways of behavior. In this sense, a useful instrument is furnished by the mandatory labeling of energy consumption by domestic household appliances as provided for under DDL 655/80.

4.1.3. Adjustments in Legislative Standards

Adjustments are necessary for combination with existing standards.

Law 457/78, with standards for residential housing construction (also known as the Ten-Year Housing Plan) which has not yet been fully implemented regarding the use of renewable sources.

In this case, the lack of standards, which must come from the CER (Residential Housing Construction Committee), prevents its correct implementation.

It is urgent for the Ministry of Public Works, in coordination with the Ministry of Industry and the regions, to grasp a standard which will take into account the various characteristics of the territory and the local environment.

The regions will furthermore systematically have to review the laws and standards under their own authority (housing regulations, urban development plans, territorial plans) in the light of the problems posed by a policy aimed at energy conservation.

It is evident that it is necessary for this purpose to do a thorough technical job also diversified among the various regions to which the research agencies (CNR, CNEN) and the responsible government agencies (MLLPP [Ministry of Public Works], MICA) will have to contribute. will have to contribute.

Law 178/80 with validity limited to the 1979-1980 heating season regarding the daily and seasonal duration of turning on the heating plants. The Ministry of Industry has submitted proposals to parliament to regulate the operation of heating plants and air conditioning systems.

Law 392/78, known as the "fair housing law," provides that the additional expenses deriving from the fair housing provision (including heating costs) shall be borne by the landlord and that the latter has the right to vote, in his capacity as owner, during the deliberations of the pertinent condominial meeting regarding the expenditures and management methods for heating and air conditioning services.

The law furthermore provides that the fair housing standard can be improved through an increase of no more than the legal interest on capital use in special maintenance work. There is therefore no sufficient incentive either for the lessor voluntarily to make investments for energy saving, or for the landlord in asking for or directly carrying out the necessary work.

Another obstacle springs from the fact that the standards of the civil code for condominial meetings are still in force; they call for a two-thirds majority in voting on "modifications and improvements."

Law 655/80. Parliament is discussing a government bill which calls for incentives for actions indicated in this plan (100 billions during the 1980-1981 2-year term).

It is essential for these incentives to be extended until 1990 and to be increased with annual allocations of no less than 320 billion lire for the housing construction sector.

This financing, drawn in the form of contributions to the capital accounts or interest accounts, should cover about 30 percent of the investments which get the benefit of these incentives.

Table 4.1/4. Saving and Efficient Use of Energy in Civilian and Residential Sectors

Summary of Allocations for Incentives (billions of 1980 lire)

	1981 + 1983	1984 + 1990	1981 + 1990
Financing already provided for by DDL 655/80	100		100
Further incentives	640	2,240	2,880
Total	740	2,240	2,980

4.1. Industry Sector

4.2.1. Current Situation

In Italy industry takes the majority share of final energy consumption; in recent years however the growth rate of industrial consumption has turned out rather more moderate; the 1979 level (47 Mtep, including nonenergy uses) is as a matter of fact higher than the 1970 level by only 6.6 percent. The share of industrial consumption out of the total final domestic consumption (for energy and nonenergy uses) during that same period of time shrank from 51 percent to 45 percent.

Compared to the situation of other industrialized countries, the Italian situation reveals the following major points:

Consumption per unit of products is generally slightly less;

The energy rate absorbed by industry as compared to total consumption is higher; this aspect is further accentuated if we look at electrical energy only.

It must be kept in mind that, in industry in general, except for some special sectors, energy--although it is an essential means for production--does not account for a significant percentage of company costs which is why measures aimed at facilitating energy savings are being properly stimulated.

The "horizontal plan" for efficient energy use is now being reviewed; it was provided for under Law 675 and pertains to industrial reorganization and conversion for the purpose of promoting the introduction of less energy-intensive processes or the reorganization of those which employ energy resources in an inefficient manner.

For more immediate steps, which do not involve substantial modifications in production processes, although they may be significant in reducing waste, the government approved Bill No 655 which it is hoped will be quickly passed by parliament. Besides,

similar to what has been provided for in the civilian sector, it will be necessary to study suitable regulations aimed at holding energy consumption for environmental heating down in the field of industrial factories.

Concerning the tariff instrument, it is felt that the domestic price policy must be standardized in line with the long-term marginal costs.

In the case of electrical energy, it is considered advisable to introduce a rate system based on multi-hour rates (in other words, differentiated according to the tapping time, that is, peak hours, full hours, empty hours, winter, summer).

These rates, already in use in other countries, have the purpose of reducing the maximum power demanded of the system, thus providing an incentive for a shift in utilization from peak hours to lower-load hours. From the consumption viewpoint likewise, multi-hour rate schedules will permit savings since it will be possible to reduce recourse to the production of peak plants which currently are those that reveal the highest specific fuel consumption figures.

We also anticipate the imminent implementation of multi-hour rate schedules for industrial users involving high voltage but it is also a good idea after that to extend this to medium-voltage users during minimum times required by the necessary preliminary performance.

The CIP has already established that the average monthly power factor of electrical energy tapping, below which the increase in the price of each kwh is applied, shall be raised from 0.80 to 0.85 as of 1 December 1979 and to 0.90 as of 1 December 1981. By persuading the users to rearrange their own user plants in terms of time, this step will make it possible to reduce losses in the grid with an energy saving on the order of 1.7 Twh per year in 1990 (0.4 Mtep in terms of primary energy).

Further steps--including steps of an administrative character--are indicated in connection with the various actions provided for under the Plan.

4.2.2. Actions To Be Launched During the Next 3 Years

The principal actions to be undertaken are as follows:

Determination of final energy uses, that is to say, quality of energy demanded for production processes;

Rationalization of production processes for the purpose of optimum energy use;

Inclusion of technological innovations, aimed at savings, in production processes;

Substitution of petroleum products with other energy sources, particularly renewable sources.

The rationalization of production processes can be the fruit of management efforts which do not call for any investments but require only organizational steps. This appears necessary in order to facilitate correct use of energy in the industrial system.

The inclusion of new technologies in production processes or the modification of those processes for the purpose of reducing energy consumption per unit of product is one of the most effective and definitive energy savings systems in industry.

Institution of Energy Saving Services in Industry

(a) Energy diagnosis service for small and medium industrial establishments, making it possible to adopt steps toward more efficient energy use.

Energy diagnosis should be performed for at least 500 industrial companies per year.

It is considered advisable above all to provide for a demonstration phase whose duration would be limited to the first 3-year term for the purpose of stimulating the dissemination of this type of service and gathering data on applicable methodologies. During that phase we will operate according to a plan drafted by the MICA (in collaboration with energy agencies and domestic industry) which will involve about 300 outfits selected in certain sectors of small and medium industry.

Studies will be conducted in these plants to identify methodologies that can be extended to groups of enterprises or entire industrial sectors.

The MICA will issue the proper directives to disclose the results and the pertinent methodologies.

Beyond the demonstration phase, to promote the creation of a service market aimed at energy savings and also to enable the enterprises not involved in the demonstration program to get the benefit of incentives, plans call for reimbursing the companies involved for the expenditures they incurred for diagnosis up to a maximum of 2 million lire per establishment with a total cost of 1 billion lire per year (calculated on an average of 500 companies per year).

To guarantee adequate professional training for diagnostic service specialists, the MICA (in collaboration with energy agencies and domestic industry) will adopt the proper steps.

(b) Disclosure of statistical data on industry's energy consumption.

The current statistical data collection system involving industry gives rise to reports on the quantities of energy sources consumed but does not supply analytical elements to figure out the final uses of energy which however is necessary for a better definition of the energy saving potential and hence for a precise arrangement of steps to be taken.

For this purpose, the MICA will propose the modifications necessary for an improvement of the data collection system, as well as the processing and dissemination of data, and, in agreement with the other possible government agencies involved, it shall take the necessary administrative steps.

(c) Information for industry on technologies and experiences regarding efficient energy use.

Many enterprises, especially small and medium ones, do not take steps aimed at efficient energy use even when they would involve only modest investments or measures of a management character out of lack of knowledge or information. It has turned out furthermore that some savings technologies, applicable to all or most industrial sectors, are overlooked also by specialized sector magazine.

To close the above gaps, the MICA will issue the proper directives to guarantee an adequate information system on the technology and experiences in energy savings and energy management in industry.

The cost of this initiative has been estimated at about 2 billions per year.

Program for Training Energy Management Experts and Technicians

For complete and continuous actions aimed at efficient energy use it is necessary to make sure that knowledge regarding energy management will be transferred to the company level. On the basis of experience acquired in some industrialized countries it is considered advisable to train two types of "energy managers": one manager suitable for big outfits who will devote all of his time to energy problems; the other manager for small and medium outfits who would take care of this on a part-time basis.

It is estimated that, to guarantee adequate energy management in Italian industry, we would have to have several thousand experts overall.

To train such a vast number of experts, the MICA, in cooperation with domestic industry, the energy agencies, the regions and the local entities, will, by 1980, draft a 3-year program which will be organized in the form of specialized seminars throughout national territory.

Implementation of Demonstration Projects and Dissemination of Results Achieved

To speed up the implementation of energy savings measures by industrial enterprises and to permit experimentation with technological processes offering higher energy yields, it is considered necessary to carry out at least 100 demonstration projects by 1983.

A significant portion of these projects will involve the three categories of industry (steel industry, chemical industry, and construction materials industry) which in Italy take up 68 percent of the energy requirements of industry as a whole. It is furthermore important to carry out projects which will bring out the possibility of materials recovery and recycling, particularly those with a high energy content, also in accordance with the CIPI resolution of 27 March 1980.

In this way, with adequate disclosure of results, it will be possible to start a transfer mechanism which will contribute to the spread of efficient energy use techniques.

The way of implementing the demonstration process will be the way outlined in DDL 655.

Financial Incentives for Energy Saving Investments in Industry

The obstacles currently holding back investments for energy savings on the part of the various companies and corporations spring from the difficulties in getting loans, especially in the case of small and medium enterprises, the limited capacity to borrow more at current interest rates and, in some cases, the investment return time. To that we must add the difficulties of taking management steps designed to maintain the attainable savings levels in terms of time.

To overcome these obstacles, we need suitable financial incentives which can be properly figured out in terms of prospects at suitable lending rates and contributions to capital accounts for projects carried out by enterprises for the sake of energy savings.

The incentives will have to be granted within the industrial reorganization policy (Law 675/77) to avoid scattering resources and promoting greater efficiency in sectors whose further development has been planned; the incentives are going to have to be dosed so as to promote essentially those investments which can help us achieve less convenient savings (marginal savings).

The grant of incentives will depend--according to the criteria to be established--on the results of feasibility studies; in that case, the cost of the study can be included in the investment cost.

As we said earlier, the legislative instruments which provide financial contributions (either into the capital account or into the interest account) have not yet become operational.

On the one hand, the horizontal plan for efficient energy use in industrial processes --as provided for under Law 675/77--has not yet been approved by the CIPI; on the other hand, DDL 655 is still being debated in parliament.

Concerning incentives for investments for industrial plant conversion toward less energy-intensive production and the reorganization of processes for the more efficient use of energy, the horizontal plan quoted will however have to provide for the following:

Continuation in terms of time, until 1990, of action to be taken by the Conversion and Reorganization Fund concerning projects aimed at the more efficient use of energy sources in industry;

Annual allocations, or contributions to the interest account of entities congruous with those planned, for the first 2 years of practical implementation, in the proposal now being examined by the CIPI (100 billions for each year).

Concerning on the other hand DDL 655, incentives through loan facilitation for investments designed to reduce energy consumption without substantial modifications in production processes will have to be continued according to the method provided for in the case of the first 2-year term, except for the adjustment of allocations to an overall level of about 140 billions per year, including 130 billions earmarked for efficient energy use undertakings alone, plus 10 billions destined for the use of renewable sources.

Determination of Minimum Energy Efficiency Levels and Energy Labeling

The use of machines and equipment with a higher energy yield is an efficient and permanent instrument for the achievement of energy savings although the effects generally are gradual since they are connected with the renewal of the increasing inventory. It is therefore a good idea to establish minimum energy yield levels also for machinery and equipment intended for industrial use.

The energy labeling provided for equipment usually employed in the civilian sector must be gradually extended also to equipment used in the industrial sector. A pertinent legislative provision will be necessary.

Actions To Use Renewable Sources

(a) Demonstration Efforts for Renewable Source Employment.

During the next 3 years, we are going to implement three or four applications in each industry sector for a total of 45 projects, about 15 per year. The main purpose of this demonstration effort is to look into all of the possible problems connected with the application of these technologies in industry (maintenance, combination with other sources, load and storage diagrams, with problems different from those in the household appliance sector). The cost has been estimated at about 5 billions per year, including also partial financing for investments. The implementation of demonstration projects has been planned according to the methods spelled out in DDL 655.

(b) Promotion Efforts

The DDL 655 provides for incentives toward the use of renewable sources also in connection with industrial processes.

To the allocations proposed for efficient energy use investments (seee Paragraph 4.2.2.) we must add 10 billions per year to provide incentives for the employment of renewable sources.

(c) Evaluation of Effects of Renewable Source Employment

The most important application of solar technology in industry pertains to the production of heat for low-temperature processes of less than 100° C. Technologies suitable for this purpose are the "solar pools," the collector panels, and the low-concentration collectors. The technology for the production of heat beyond 100° C is now in the development stage; it is however not anticipated that it could play a decisive role by 1990.

Possible other technologies, such as those pertaining to biomas, can make only marginal contributions over the next decade, except for the use of biogas for combined production (reference is made here to agricultural projects and joint generation).

It is expected that heat consumption for low-temperature processes in industry will be 5 Mtep by 1990. Therefore, in the case we attain the maximum penetration

potential of solar technology, amounting to 10 percent of the market, we would, in 1990, have an annual saving that could be estimated at something like 0.5 Mtep.

4.2.3. Indications as to Development Outlines for Research

To make new technologies available to industrial plants, technologies that can contribute effectively and permanently to the efficient use of energy, we will now list the main lines of development for research activities:

(a) Research and development of heat exchangers and other components for low-temperature and medium-temperature cycles with high efficiency and capable of functioning in hostile environments;

(b) Research and development on optimum combustion processes;

(c) Research on development on heat pumps for industrial processes;

(d) Optimization and automation of industrial processes for the purpose of their rationalization in terms of energy;

(e) Development of new technologies (processes and/or components) designed to hold the energy demands down.

All of the above activities will have to be paralleled by economic studies and estimates dealing with the other factors that constitute incentives toward energy rationalization regarding industrial processes. Special attention will have to be devoted to exchange between factors (capital-energy, manpower-energy) and the not just financial convenience of possible exchanges.

In the context of research, development, and demonstrations synthesized in the objectives listed above, it will finally be necessary to give preference to activities aimed at the saving and substitution of petroleum derivatives.

The details of the actions indicated above and the necessary allocations will be given in the PNRE which is now being drafted by the Ministry of Scientific and Technological Research.

Saving and Efficient Use of Energy in Industry
Summary of Allocations for Incentives (billions of 1980 lire)

	1981-1983	1984-1990	1981-1990
Energy diagnosis service	3	--	3
Information for industry	5	8	13
Energy management expert and technician training program	12	12	24
Demonstration projects and dissemination of results obtained	30	30	60
Incentives for energy saving investments	690	1,610	2,300
Total	740	1,660	2,400

The figures given above include the allocations provided for under Law 675 and DDL 655 and exclude those pertaining to the dissemination of renewable sources listed in Table 3/5/3.

4.3. Agriculture Sector

4.3.1. Current Situation

Direct consumption involved in the agricultural production department comes to 2.37 Mtep including 0.67 for low-temperature heating uses; 0.20 for electrical energy; and 1.5 for fuel. In addition we must consider another 5 Mtep/year of indirect consumption involving primarily chemical products used for agricultural production (fertilizers, pesticides) as well as the infrastructure facilities, including agricultural machinery. Their energy value, calculated for this production factor, turns out to be higher than the figure for direct consumption absorbed by it.

The energy demand is characterized by major variability in terms of time and types of energy, with daily, weekly, and monthly peaks likewise between four and five times higher than the average annual figure. Besides, it is distributed throughout the territory in many small autonomous user facilities which, roughly speaking, can be estimated to cover the Italian agricultural establishment assets as a whole (more than 2.5 million agricultural establishments) as well as the initial processing industries (another 150,000 units). Regarding the needs of civilian settlements in rural areas, finally, we must recall that the rural population is distributed over no less than 30,000 small settlements.

In Italy, the average energy consumption of the agriculture sector remains low even when compared to that of other countries because of the limited technological development of a large portion of the agricultural establishment. Although agricultural consumption as a whole went up over the last 30 years, it did not manage to keep up with the noticeable increase in food consumption. This is primarily due to a policy which is not coordinated toward the achievement of a balanced development of the production sector.

The sector's anticipated development however, along with other parameters, makes us think that there will be an increase in direct energy demand, as follows: for agriculture in the South, above all in terms of refined energy to meet the makeup needs in mechanization; for agriculture in the North (on a livestock basis) above all in terms of heat energy to improve product conservation and to reduce losses.

In general terms, we cannot overlook the fact that a large number of agricultural establishments--in other words, family settlements--is still without electrical energy (about 300,000 persons).

In the light of the above, the most accepted assumptions point to an anticipated increase, by 1990, of direct consumption on the order of 35 percent as compared to current figures. This percentage among other things takes into account a change in the ratio between energy input kilocalories spent and biological kilocalories obtained which for 1977 were estimated at 1.01.

For the sake of homogeneity, the energy saving in the food industries will be taken up in context with the other industries. We might however point out that one should not overlook the close interrelationships between actions in the entire agricultural and food sector where it is not improbable that one might eliminate the many distortions which right now make Italian agriculture rather marginal, nonprogrammable, and rather at a disadvantage when compared to the industrial component.

4.3.2. General Objectives

Starting an action program in the agricultural sector aimed at energy savings and independence from petroleum products assumes particular importance here.

The savings objectives which can be attained, although limited, when compared to those in other sectors, certainly are worthwhile because of their effects on the costs.

This effect is particularly significant in the current situation where we extremely urgently face the need for providing new impetus for the agricultural production development process which obviously is running into a restriction of an economic nature that cannot be overlooked through the cost of energy.

It is furthermore noted that, in general, the important thing is to launch a profound conversion system from one fuel system to another, more articulated and complex energy source system.

In spite of that, we can establish the objective of attaining, by 1990, an energy savings in the agricultural production sector equal to 10 percent of its direct and indirect consumption.

Noticeable savings can be achieved also in rather short time by means of efforts aimed specifically at preventing some of the current energy waste.

In economic terms, an objective which would lead to a reduction in actual consumption by about 1 Mtep (0.3 Mtep in direct consumption and 0.7 for indirect consumption) would justify proper action in this case.

For this purpose, the areas of action essentially involve the introduction of the employment of renewable energy sources by way of replacement of conventional sources and the utilization of new technologies which will facilitate by no means minor savings.

We furthermore cannot overlook the possibility offered by the use of joint generation on the level of company power plants, especially for those in remote areas, through the production of electric energy to be used for running machines and heating systems for processes.

The use of renewable energy sources is particularly promising in the thermal energy generation sector for agricultural drying and product conservation processes, for greenhouse productions, as well as for room air conditioning.

We will also properly exploit the energy obtainable from biomasses made up of by-products of vegetable and animal origin (generation of biogas, direct burning of wood, etc.).

The objectives and pertinent savings efforts concerning consumption in agriculture as compared to the housing sector, the product processing and conservation industry, as well as the transportation industry, are subjects for earlier chapters on savings.

4.3.3. Actions To Be Taken During 1981-1983 3-Year Term

(a) Adoption of public incentives through necessary legislative steps already planned and which parliament hopefully will pass as quickly as possible in order to provide the financial aid that will make alternate energy uses competitive from the economic viewpoint.

This action also provides for steps dealing with the regions and autonomous provinces so that, in their authority to implement (Law No 984, the so-called "agricultural development law," they will not overlook the importance of using renewable energy sources, granting financial contributions also for them.

(b) Adoption of a national experimental and demonstration plan to determine--on the practical application level--the energy savings and the use of alternate energy forms in an individual and combined fashion through agricultural pilot enterprises. The ministry of agriculture will have to work with the national energy agencies, industry, and interested agricultural organizations. During the 3-year period, we anticipate the implementation of combined systems featuring alternate energy sources and energy savings techniques in at least 50 agricultural enterprises, scattered throughout national territory, for the purpose of looking at the various soil and climatic situations and investigating the various crop cultivation and animal-raising policies, so as to come up with an initial sufficiently representative picture of how renewable sources can be used in the sector, at least partly replacing traditional energy sources.

(c) Dissemination of results achieved in research and experimentation in the energy saving sector and renewable energy sources, both in dealing with the agricultural establishments and the agricultural-food industries. This effort, which must be

given high priority, will be carried out, for the agricultural production sector, by the already operational agricultural technical offices under various regional advisory offices for agriculture. The latter must establish the proper specialized sections in order--according to the provisions in the institutional specifications --to supply technical assistance, vocational training, and briefing of agricultural entrepreneurs on alternate energy sources and energy saving techniques.

To speed up the development of this institutional task of the regions, the MICA (Ministry of Industry, Commerce, and Crafts), by agreement with the Ministry of Agriculture and Forestry, shall make prop.. information support for this initiative available to the regional agencies.

(d) The objectives stated here are designed to launch a technical assistance drive, which, as indicated in point (c), using already existing structures throughout the country, could take charge of the activities necessary for rationalization of energy use in the agriculture sector. In particular, in the agricultural production department, the activity will be aimed at more efficient mechanization and employment of fertilizer, as well as an analysis of the possibility offered by the use of alternate energy.

In the initial processing industry sector, similar technical assistance should be aimed at checking into current processes and the launching of subsequent actions aimed at recovery of heat losses and rationalization of processing cycles. This investigation will also include the adoption of passive steps in the various establishments.

(e) Within the PNRE, boosting the applied research activities on the agricultural level and the agricultural-food industry level for the adoption, respectively, of bio-agronomic systems and agricultural products processing procedures as well as industrial use of biproducts to improve the imput-output ratio in the course of time.

In this connection we recall that, with the help of several experts, the Ministry of Scientific Research drafted a program document entitled "Ricerche su energie per e dal sistema agricoltura-consumi" [Research on Energy Sources for and by the Agricultural Consumption System] whose research topics are summarized below:

Definition of energy requirements of agricultural-consumption systems;

Quantitative expression of savings attainable in the system and study of agriculture-forest subsystems with improved product/consumption ratio;

Census of biomasses existing in the form of residues [waste];

Optimization of technologies for energy transformation of biomasses;

Production of biomasses;

Study of integrated systems.

The cost of this research activity has been estimated at 20 billion lire.

Table 4.3/1. Saving and Efficient Use of Energy in Agriculture Sector
Summary of Allocations for Incentives (billions of 1980 lire)

	1981-1983	1984-1990	1981-1990
Experimental and demonstration projects in agricultural establishments (1)	20	20 (3)	40
Dissemination of results and technical assistance (programs C and D) (2)	30	20 (3)	50
Total	50	40	90

(1) The financial commitment demanded by this demonstration plan, which comes to about 20 billions, will be distributed over the budgets of the interested ministries as well as the agencies involved in the plan; (2) For the item under consideration here, we anticipate a financial commitment by the interested ministries and various agencies, added to the activities which those ministries and agencies are already performing and which, among other things, would call for the use of previously existing structures, amounting to something like 10 billions per year; (3) Rather rough figures, reported here mostly for reasons of completeness.

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[Text] Energy Plan--VI. In this issue we conclude the 4th Chapter of the National Energy Plan dealing with the transportation sector and the combined production of heat and electrical energy.

4.4. Transportation Sector

4.4.1. Sector's Energy Consumption Situation

In 1979, the transportation sector consumed about 25 Mtep, in other words, 17 percent of the primary consumption volume.

The energy source used primarily here is petroleum which meets 97 percent of the needs.

Automotive vehicles take up about 50 percent of the primary consumption in the transportation sector, while industrial and commercial vehicles and buses use about 38 percent, aircraft 7 percent, railroad trains 4 percent, and other means of transportation (ships, motorcycles, etc.) 4 percent.

A. Passenger Transportation Demands

Passenger transportation in Italy is at lower levels when compared to other more advanced European countries and it is mostly concentrated on private transportation which provides about 70 percent of passenger movement.

The low mobility level can be seen from an international comparison of the annual average consumption of petroleum products per vehicle which in Italy is 640 kg, against figures of 1,000 kg in France, 1,100 kg in Germany, and 990 kg for the EEC average.

It must however be noted that the lower level of Italian consumption is due not only to the lower mobility level but also is an effect of a motor pool makeup involving vehicles with a lower average number of cylinders.

The public and private passenger transportation demand is destined to go up over the next several years at rates around 2.5 percent per year on the average.

We are going to have the greatest increases in movement in extraurban traffic where we are going to record growth rates of 3.5-4 percent on the average per year, above all due to the heavy increase in tourist and vacation traffic over long distances. The per-capita expenditure for tourism as a matter of fact in Italy is still rather low; in 1977, it was 115,000 lire per year as against 205,000 for the Germans and 260,000 for the French.

Mass transportation should carry increasing weight in meeting the long-distance transportation demand; however, throughout the entire time span of the plan in must be kept in mind that this traffic will still mostly be handled by private vehicles.

Urban traffic will reveal lesser growth rates (about 1 percent per year) due to traffic congestion and the shortage of parking lots in big cities as well as the decline in population movement toward urban centers.

Ways of handling urban traffic will be oriented toward an increase in the use of public transportation systems.

B. Freight Transportation

Freight transportation will increase more markedly than passenger traffic (up 3.5 percent on the average per year) due to the industrialization process in the South and due to the decentralization of industrial sites.

Commodity traffic should be oriented as much as possible toward railroad, maritime, and river transportation. But it must be kept in mind that the time frame and the dimension of the financial commitment necessary to develop these transportation systems in a massive fashion will create a situation where goods transportation will still remain mostly concentrated on highways.

4.4.2. Objectives of Energy Consumption Rationalization and Necessary Steps

Energy savings in the transportation sector must not be achieved through a cutback in the increase for transportation demand (an essential component in the development of the country's economic activities) or through coercive measures which would penalize transportation means but which would improve the energy efficiency and the structure of the transportation system.

This sector's heavy dependence on petroleum products (over the next several years as a matter of fact we are not assuming any major substitutions with the help of alternate fuels for automotive vehicles and industrial vehicles) furthermore imposes the implementation of a general energy policy which would give preference to channeling the petroleum source toward the transportation sector.

The consumption reductions which can be achieved by 1990 in the transportation sector can be obtained through the following:

A. The practical implementation of the transportation system;

B. The reduction of specific transportation consumption;

C. The improvement of vehicle driving and maintenance methods;

D. Diversification of fuels used.

A. Practical Implementation of Transportation System

Indications regarding the lines of action to be taken toward the rationalization of the transportation system show that this is evidently not a specific task under the Energy Plan alone so that the steps which can be taken in medium-range terms and which will have an effect in terms of holding energy consumption down are as follows:

Increase in efficiency and boosting of urban mass transportation;

Improvement of urban traffic flow;

Boosting and improvement of efficiency of rail, ship, and river freight transportation systems as well as intermodal systems;

Increase in highway freight transportation efficiency;

Boosting the airport infrastructure;

Greater use, in public transportation systems with high urban and suburban density, of electrified transportation, a development which must however be compatible with a noticeable reduction in the electrical energy share produced from hydrocarbons;

Improvement in energy efficiency of vehicle pool with rapid introduction of new low-energy-consuming vehicles and with the implementation of steps facilitating energy savings in existing transportation equipment.

B. Reduction of Specific Consumption of Individual Products

The reduction in energy consumption will have to involve all means of transportation but particular emphasis will have to be given to automotive vehicles, industrial vehicles, and buses since these transportation means take up about 85 percent of the total consumption.

Reductions of specific consumption by the various means of transportation are feasible through a series of actions, particularly:

(a) Automotive Vehicles

Improvement in engine output (optimization of combustion, fuel supply, distribution and ignition, introduction of electronic engine controls, etc.); improvement of transmission and gear system (continuing gear shifts and electronic controls); reduction in weight; improvement in aerodynamics coefficient; reduction [sic] in resistance to friction and rolling motion.

(b) Industrial Vehicles

Improvement in engine output (extension of fuel oversupply, direct injection systems, modulation of injection as a function of the load and the rates, etc.); increase in transportation/tare weight ration; optimum selection of gear ration; reduction in resistance to friction and rolling motion [sic]; improvement in external and internal aerodynamic penetration coefficient.

(c) Trains

Recovery of braking energy both in electrical and in diesel traction (in the latter case with accumulation systems on hybrid engines); lightening the rolling stock (although this step can yield results only in the long run because of the long span of time involved in rolling stock renewal); increase in occupation and load coefficients of passenger coaches and freight cars through improvement in booking systems.

(d) Aircraft

Support for Italian participation in development programs for vehicles using turbojets with high energy efficiency and with better aerodynamic profiles so as to permit their rapid introduction into the Italian inventory.

In longer-range terms, support for Italian participation in the development of new turboprop aircraft.

(e) New designs of bodies, engines with power plants involving a lower specific consumption (more diesel engines), improvement of combustion, extensive energy recovery (total-energy ships). These steps however can yield major results if we develop closer cooperation among outfitters, the shipbuilding industry, and power plant builders.

C. Improvement of Combustion Methods and Vehicle Maintenance

The primary steps that can be taken here are as follows:

Adequate information on vehicle driving and maintenance methods;

Accurate check on motor pool efficiency;

Increased check on speed limits and determination of new levels.

D. Diversification of Fuel

The petroleum saving in the transportation sector can be carried out also through diversification of fuels (although great savings cannot be assumed along these lines).

In particular, the following principal actions can be taken in short-range and medium-range terms:

Partial substitution of gasoline by gas-oil through greater use of diesel engines;

Increase in use of methane both for highways and railroads; this applies even though the output and safety problems remain yet to be resolved adequately;

Greater utilization of LPG in specialized fleets;

Employment of methane and ethanol-gasoline mixtures;

Use of very heavy oil fractions or mixtures of fuel oil and coal in ships.

In longer-range terms, among the steps which can be taken, we have the development of electrical means of transportation (particularly vans for goods and minibuses). It must be remembered that the electrical vehicle not only facilitates a differentiation in energy sources but also permits an environmental improvement through a reduction in noise and the absence of emissions.

The spread of electrical vehicle use during this initial phase is tied to the dissemination of urban vehicles, particularly medium-sized industrial vehicles (vans for merchandise delivery, minibuses, etc.).

A reasonable objective regarding the increased use of these vehicles might be the achievement, over the next 10-15 years, of an output of about 5,000 units per year and this number should make it possible to get the market started.

To attain this objective, it is necessary to provide for a financial support effort lasting 10 years and involving a total expenditure of some tens of billions.

Among the possible users of electrical vehicles, public agencies and companies should play an important role and they should facilitate the start of the market with public orders.

Along with this support it is necessary to provide other types of action: lower night-time rates, exemption from traffic tax, favorable terms for mandatory insurance, access allowed to restricted traffic zones and pedestrian islands.

The development of electrical traction means on a large scale however is compatible only with a coherent policy of channeling the various petroleum products toward the most efficient and most economical uses. In particular, the development of electrical transportation means can be pursued only when the output of electric energy from petroleum sources has been replaced by other sources.

4.4.3. Instruments and Necessary Steps

A. Standards

The standards which it appears necessary to introduce to promote energy savings involve the following:

(a) Checking on energy consumption by the motor pool

In analogy to what is happening in the other European countries, it seems a good idea to issue adequate standards for gradually stepping up technical controls (safety and energy efficiency) of automotive vehicles, buses, and commercial and industrial vehicles.

For automotive vehicles and commercial vehicles, technical inspections should properly be performed every 2 years, starting with the 4th year of the vehicle's existence. For buses and industrial vehicles, technical inspections should be annual. For this purpose it seems advisable to boost the current agencies responsible for safety inspections by granting authorization to perform these inspections in qualified shops.

It is furthermore a good idea to urge all public and semipublic agencies (regions, communities, railroads, Alitalia [Italian Airline Company], etc.) periodically to perform a rigid inspection of the energy efficiency of vehicles owned by them.

(b) Speed limits.

To extend compliance with speed limits it will be necessary to issue proper standards to make controls stricter and more frequent.

Initiatives will also be developed on the community level to reduce maximum speed limits in EEC countries.

(c) Coordination of components according to energy savings criteria.

Initiatives are going to be promoted on the community level to establish standards and parameters for components and parts coordination applicable to the EEC countries which would also take into account the matter of energy efficiency.

(d) Standards on emissions.

In spelling out the standards and parameters on emissions, it will be necessary properly to take into account the increased energy consumption which these standards might involve, as well as the higher costs for the transportation equipment.

B. Fiscal Action

(a) Traffic Tax

It seems advisable to amend the current taxes on automotive vehicles through progressive assesment systems calculated as a function of unit consumption. This

amendment should be implemented in accordance with the EEC standard; it should first of all involve the automotive vehicle traffic tax. It is furthermore necessary to determine the advisability of providing for possible tax exemptions for fleets of vehicles using alternate fuels.

C. Incentives for Improvement of Energy Efficiency of Transportation Equipment

Incentives are going to be provided for the following steps:

(a) Development of prototypes and components of transportation equipment with low energy consumption or capable of using alternate energy sources, other than petroleum, and their initial industrialization.

Contributions are going to be granted to national enterprises for the development of prototypes and components of transportation equipment (automobiles, industrial vehicles, buses, trains, ships, aircraft, etc.) with low energy consumption and capable of using alternate energy sources other than petroleum and for their initial industrial production.

The contributions should be fixed in a degree no less than the maximum action parameters in the IMI [Italian Credit Institute] fund for applied research.

Support efforts are going to have to be tied in with other incentive measures, with particular reference to those provided for in the various finalized sector projects drafted by way of implementation of Law 675 on industrial reorganization.

Priority must be assigned particularly to projects in the automotive sector so as to permit prompt and specific implementation of actions outlined in the finalized program of the autoindustry both regarding support and promotion of research activities in long-range terms and concerning innovation and development activities.

(b) Improvement in energy efficiency of transportation equipment inventory.

To speed up the improvement of the energy efficiency of the entire transportation inventory, a contribution of 50 percent of the expenditures, incurred for diagnosis on the causes of vehicle inefficiency, will be granted along with the first energy efficiency inspection of the transportation inventory as mentioned in Point A., Paragraph 4.4.3. This diagnosis will include a report on any possible need for replacing parts or components or introducing devices which would improve the vehicle's energy efficiency. Concerning maritime transportation, special forms of incentives will be introduced in favor of the introduction--in existing ships--of equipment and systems with higher energy efficiency.

(c) Boosting the recycling of transportation equipment now not in use.

Ways are going to be studied of providing incentives and specific standards to promote the recovery and efficient recycling of unused vehicles so as to provide greater efficiency in this activity.

D. Steps To Improve Traffic Flow

(a) Improvement in Urban Traffic Flow

It seems a good idea to pass a law establishing traffic plans for urban centers with more than 100,000 inhabitants. This law should outline the objectives to be pursued, the possible financial aid to be granted, and the type of most appropriate technical solutions (preferred routes for public transportation; traffic restrictions in historical downtown areas; creation of proper parking lots in downtown areas, for example, by setting some streets aside for parking, proper signals for fast-lane movement and alternate routes; electrically controlled semaphore systems, definition of suitable work schedules for industrial establishments, the government, the schools, and the delivery of merchandise to stores and shops, etc.) so as to permit the local administrations to arrange adequate traffic movement plans.

(b) Improvement in Extraurban Traffic Flow

It is necessary to step up studies on possible improvements in traffic flow on major arteries (elimination of heavily curved roads, increase in beltways, setting aside exclusive lanes for heavy vehicles on superhighways, repaving, etc.) so as to permit the launching of priority projects. Along with actions of an infrastructure nature, it will be necessary to introduce new traffic management and organization systems (for example, magnetic tags prepared for the payment of highway tolls) to make it possible to reduce traffic jam points.

E. Action To Boost Mass Passenger Transportation and Rail and Ship Freight Transportation

(a) Increase in Efficiency and Boosting Urban Public Transportation

It seems advisable to pass a law establishing urban transportation plans replacing Law 1049 for subways [metropolitan transportation systems] and taking into account the indications proposed in the bill involved in DDL 228-528, dated 15 May 1980, on the National Transportation Fund, outlining the funding and the objectives for the development of light metropolitan transportation systems, the renewal and increase in the inventory through the addition of more efficient vehicles, the supply of special vehicle fleets (taxi cabs, service vehicles, etc.) running on fuels other than petroleum.

These plans should be developed by the communities or by a group of contiguous communities with at least 400,000 inhabitants in agreement with the regions and transportation companies.

(b) Improvement and Boosting of Rail and Ship Transportation Systems

Approval should be sought for measures to refinance projects (already partly financed) for the boosting and improvement of the efficiency of the railroad network.

This should make it possible to launch the relative portion of the Combined Railroad Plan. It would then be necessary to review the Railroad Development Plan in

order better to define the type of action provided for also in relation to the requirement for introducing intermodal transportation systems and systems for interconnection between the various types of transportation. An effort should furthermore be made to work toward the implementation of the legal-organizational reform for the ports and the start of actions aimed at the completion and boosting of port structures and the fleet through a modernization of ships and the upgrading of port receiving facilities.

(c) Improvement of Air Transport

It seems a good idea to draft a general plan for airports, as provided for under Law No 299, dated 27 July 1979, making it possible to restore the balance within the airport system as a function of traffic flow, support facility requirements for waiting times prior to takeoff and landing; and the need for modernizing the fleet of aircraft through the introduction of more energy-efficient aircraft.

Table 4.4./1. Saving and Efficient Use of Energy in Transportation Sector
Summary of allocations for incentives (1), (2) (billions of 1980 lire)

	1981-1983	1984-1990	1981-1990
Development of automotive vehicle prototypes and their parts with high energy efficiency and first industrial production	600	1,000	1,600
Development of industrial vehicle and bus prototypes and their parts with high energy efficiency	210	390	600
Development of parts for other means of transportation (ships, aircraft, trains, etc.) with high energy efficiency	180	320	500
Improvements in energy efficiency of automotive vehicle pool, buses, and industrial vehicles	80	--	80
Boosting of unused vehicle recycling	90	210	300
Expenditures for boosting energy efficiency inspection structures	60	140	200
Total	1,220	2,060	3,280

(1) Incentives for applied research for energy savings in the transportation sector are estimated according to the PNRE at 120 billions for the 3-year period of 1981-1983 and 280 billions for the period of 1984-1990.
(2) Public actions pertaining to efforts mentioned under points D and E, Paragraph 4.4.3, were not included in the table because they belong within steps dealing with the infrastructure facilities which spring from multiple requirements even though they have an effect on energy efficiency.

All of the actions designed to improve the infrastructure facilities connected with transportation and the renewal and boosting of mass transportation should be coordinated by an appropriate interministerial commission to be established under the Ministry of Transportation or the CIP, which should spell out the pertinent authority, the need for reorganization of public agencies dealing with transportation, and to guarantee the coordination of all efforts within an overall sector plan.

F. Public Financial Support

Table 4.4/1 shows the public financial support necessary for the next decade to promote energy savings in the transportation sector.

The actions provided for or requested in the preceding points of this paragraph in some phases are included in broader efforts which meet multiple requirements although all of them are motivated in terms of "energy."

To avoid inserting, into the Energy Plan, financial commitments which deal with other necessities, the table indicates exclusively public support efforts for actions or parts of actions more directly dealing with the objective of energy savings. The table therefore does not show public financial action inherent in efforts aimed at the improvement of infrastructure facilities and the boosting of mass transportation (points D and E in this paragraph).

Support for activities dealing with applied research, always aimed at energy problems, estimated at about 400 billion for the decade, will require coverage to be spelled out under the PNRE.

Furthermore, some areas (cars, mass transportation, aviation) are or will be the subject of appropriate finalized sector project which, within the innovation program area, can also provide for broader actions relating to energy savings. In this case, financial support for efforts aimed at energy savings, as indicated in the table, for the development of prototypes and parts of automotive vehicles, trains, ships, and aircraft, can be covered in terms of money by using the funds and the operational instruments outlined in the final project version.

4.5. Combined Production of Heat and Electrical Energy

4.5.1. Premise

Combined production (joint generation) consists in simultaneously producing electric energy and heat. The advantage of such an operation in energy terms is represented by the fact that, in this way, the quantities of primary energy necessary will be less when compared to the separate production of heat and electrical energy.

As a matter of fact, assuming a figure of 100 for the consumption of primary energy, joint generation gives us an average of 20-25 for electrical energy and 40-50 for heat, in other words, a utilization factor of something like 70 percent for both forms of energy (that is, equivalent to a saving of about 30 for every 100 consumed in case of separate production efforts).

From the energy and environmental viewpoint and hence without looking into the merit of the type of fuel used, joint generation offers undeniable advantages. But when the heat user is not in the immediate vicinity of the place where the heat itself is generated, the above operation entails the need for heat transportation and distribution networks which will have to be all the more extensive, the lower the heat use density happens to be, with subsequently high investment costs.

In these cases, that is to say, if we have heavy capital costs, we understand that the plant utilization factor assumes an important role, hence, also the duration of service over the years which, in the more specifically civilian case, is tied to climatic factors, for example. Joint generation in the industrial sector on the other hand is generally characterized by high-intensity heat uses close to the joint generation plant rather than the duration of heavy utilization.

It is therefore necessary carefully and correctly to analyze the various cost items so as to arrive at a much more objective judgment on combined generation and on the aspects which can make it generally advantageous or less advantageous.

Regarding in particular the long-distance heat systems associated with joint generation plants, the economic margin for the convenience of these systems is represented by the saving on the quantity of fuel necessary, assuming equal generation of heat and electric energy, as compared to the conventional solutions (individual boilers and plants generating only electrical energy) which can be destined to cover the possible higher costs of combined production plants as against those used for separate production, above all the costs of the heat transportation and distribution network.

It is evident that, on a national scale, also under conditions of economic equality between fuel savings and higher investment costs, other advantages work in favor of combined production, such as the job aspects and the acquisition of technological knowhow and orders by Italian industry, particularly environmental ones (elimination of widespread contamination from individual heating plants only, replaced by systems equipped with effective pollution control and dispersion systems). If we were to express the above advantages in quantitative terms, the advisability of using remote heating systems deriving from joint production turns out to be obviously greater.

4.5.2. Current Situation

In the field of combined production, it is necessary to distinguish between the industrial and the civilian sectors as far as the current situation in Italy is concerned. As we have seen, the problems as a matter of fact are quite different, as different as the time required for implementation and the lifetime necessary for a return on the initial investment.

In the first case, as a matter of fact, we have seen a noteworthy development in combined production and we may well assume that further developments can be achieved in this field.

Regarding on the other hand the situation in the civilian sector, other than the Brescia case, there are no significant examples in this field in Italy; we therefore consider the possibility of increasing the contribution to combined production which can be made also by the civilian sector, considering however the climatic aspects and the major cost of infrastructure facilities (remote heating networks) which would have to be installed.

In the following we will analyze the two sectors separately.

Industrial Sector

In this field we have had a combined production development which is entirely comparable to that of the advanced countries in that sector; for example, in 1979 Italy had an in-house production of electric energy through combined generation (of heat and electrical energy) amounting to 87 percent of the total industrial thermoelectric in-house generation volume and 17 percent of total Italian conventional thermoelectric output; overall, the in-house production by combined plants covered 23 percent of the total electric energy consumption for industrial uses.

There are however still areas of possible expansion of combined production, such as:

Industrial thermal uses involving small and medium dimensions with sufficiently constant demand diagrams throughout the year which today, in contrast to what happened prior to 1973, can turn out to be advisable in the light of rising petroleum product prices;

Energy rationalization of industrial areas with coverage of energy and heat needs through installation of consortial joint generation units;

Other development areas to be pushed include the possible installation of gas turbines up-line from existing joint generation plants and the adoption of thermodynamic cycles using organic fluids.

Civilian Sector

As we said, the major contribution from combined production in the industrial sector in Italy is not paralleled by a noteworthy contribution from the civilian sector.

Among the factors which explain the current Italian situation in the civilian sector, we must recall the following: the climatic aspects, the considerable investments necessary for the creation of heat distribution networks, practically nonexistent today, the extensive spread, in the north, of natural gas distribution systems for civilian uses.

Italy has only recently launched some undertakings and numerous technical-economic feasibility studies on both large and small systems; it is necessary furthermore to analyze the results of these studies on the basis of a rigorous and common judgment criterion which would also take into account the other possible actions aimed at energy savings in the civilian heating sector. Here it seems difficult to come up with any estimates, even approximate ones, on the overall quantity of fuel that

can potentially be saved by 1990, also taking into account the time span needed for building the networks from the engineering angle.

It must finally be noted that the supply of the remote heating systems from the thermoelectric plants of the ENEL facilitates maximum diversification of fuels used for urban heating; in this way, as a matter of fact, in addition to the above-mentioned energy advantages, it is possible to refrain from using other expensive fuels for heating, such as gas-oil or natural gas, today generally employed in individual boilers, shifting this heating system (indirectly) for example, to the use of coal.

The above statements assume that the implementation of long-distance heat systems, supplied by ENEL power plants, will necessarily involve the simultaneous implementation of ENEL's new plants program.

4.5.3. General Objectives and Efforts To Be Undertaken

The general objective must be to identify the civilian and industrial uses which can possibly be taken care of through joint generation, taking into account the characteristics of heat use in relation to specific local situations, within a correct energy and technical-economic study framework.

In this context, the Consultative Committee for Combined Production, established by virtue of the Decree of the Minister of Industry dated 25 June 1979, following the Recommendation of the EEC dated 25 October 1977 (77/714/EEC) launched a nationwide survey aimed at identifying areas where there are further possibilities of developing combined production in the industrial and civilian sectors also through the construction of consortial plants; within these areas, it is necessary to perform technical-economic feasibility studies which will enable us to launch specific initiatives.

The above survey will also make it possible to gather the first data and information elements which, in a broader context, with the help of reports and investigations coming from other sectors, will improve our knowledge on the Italian situation regarding the final uses of energy and fuels currently employed and potentially usable (heat map).

In the various utilization sectors it is furthermore necessary to launch studies and demonstration projects to identify the solutions most suitable for the development of joint generation.

To promote the development of joint generation plants, it will be necessary to study suitable forms of providing incentives;

In the industrial sector, the possibilities of the enterprises to dimension and/or reorganize the existing joint generation plans, above and beyond the mere limits of company convenience, today appear heavily influenced by the situation on the money market, although this involves investments characterized by relatively short return times. The incentives therefore should give preference to investments with higher marginal cost as well as the construction of demonstration plants; the

incentives will be granted on the basis of technical-economic feasibility studies which must prove the value of the undertaking to the community as a whole and coherence with the industrial conversion and reorganization policy (Law 675 of 1977).

Although it is difficult to estimate the total volume of funds to be earmarked for such incentives, we can estimate in a rough approximation that an allocation of 20 billion lire during the 3-year period of 1981-1983 could enable us to start undertakings of major size.

In the civilian sector, the investment return time spans for urban long-distance heating systems supplied through joint generation on the other hand are much longer; besides, the programmed efforts are going to cover time frames projected at least up to the year 2000.

Keeping in mind that the higher investment expenditures can be tied in with the networks (whose nature and size varies, from one case to the next), it is even more difficult in this sector to make any estimates as to incentives for investments pending the completion of feasibility studies now underway.

Among those we might mention the cases of Venice-Mestre, La Spezia, Milan, Modena, Mantua, etc. On the basis of the initial estimates which have come out, particularly for the case of Milan, we might say that investments on the order of 50-100 billions per year would take care of the construction of the most significant projects.

In relation to the above one can therefore reasonably estimate--for the 3-year period of 1981-1983--an allocation of 3 billions for incentives, surveys, and feasibility studies and 60 billions for starting the first projects.

This latter figure was determined by extending, over the 3-year term, the contributions of 40 [illegible in photostat] billions already provided for under DDL 655 for the 2-year period of 1980-1981.

4.5.4. Instruments

(a) Institutional and Legislative

The current general institutional and legislative framework permits specific initiatives in the long-distance heating fields, although some modifications of a normative character are going to be made (for example, the mechanism of thermal reimbursement on the part of the Equalization Fund in the case of diversion of heat from ENEL centers, in order not unjustly to penalize urban heating in this case) and we are going to look for steps aimed at possible improvements on the operational level to be checked out in specific implementation cases. The character of public utility for projects in this field would also be justified in this manner.

(b) Organizational

Both the study phase and the practical implementation phase call for the broadest possible involvement of the local levels of government (regions, communities,

city-owned and consortial companies), the energy agencies, and domestic industry, as well as academia and scientific circules (CNR).

It would furthermore be a good idea for the competent agencies, both on the ministry level and among the regional and local administrations, to furnish guidelines for the preliminary preparation of urban and territorial layout plans which would take into account the possible development of long-distance heat networks and pertinent combined generation plants.

(c) Financial

Contributions provided in the following form must be made available for suitable solutions:

Capital account contributions,

Loan financing,

Contribution in proportion to the quantity and quality of energy savings.

Table 4.5/1. Joint Generation
Summary of Allocations for Incentives (billions of 1980 lire)

	1981-1983	1984-1990	1981-1990
Industrial plants	20	40	60
Surveys and feasibility studies on civilian plants	3	7	10
Civilian plants	60	120	180
Total	83	167	250

[30 Jan 81 pp 98-106]

[Text] Energy Plan--VII. In this issue we report the first part of the 5th Chapter of the National Energy Plan concerning "other areas of action."

5.1. Petroleum Emergency Plan

One of the plan's objectives is to improve Italy's energy supply security.

The goals provided here however will be reached gradually; in the meantime, international crisis situations might arise which could reduce or interrupt shipments of energy necessary for the operation of the Italian economy for more or less long periods of time and in more or less significant quantities; it is therefore necessary for Italy to have a plan for coping with such an emergency situation.

This plan must essentially revolve around petroleum but also other sources since it is to a greater or lesser extent subjected to unknown factors dealing with

continuity of supplies; we must therefore consider the entire complex of relationships between available energy and its utilization by the economic system with a view to steps aimed at safeguarding maximum possible production activity levels.

In the petroleum sector--which is certainly the sector that is most exposed to recurring crises--in accordance with the decision made in June, for the period between 1 October and 30 November of the current year, the AIE (International Energy Agency) is carrying out an exercise which has been labeled AST-3 (the third exercise from the start of operations of the AIE), designed to check into the responses of petroleum emergency mechanisms both under the agency itself and among the member countries.

As we know, the charter of the AIE, in which 21 industrialized countries participate along with Italy, calls for a solidarity mechanism among member countries; if there should be a significant shortage of petroleum products, with a provision of two shortfall levels of 7 percent and 10 percent, then there will be an equitable distribution of available products in one or more member countries with reallocation of products from countries which have a surplus when compared to the countries that have a shortage.

Provision has however been made that, before the procedures of equitable distribution are set in motion, the country hit by the supply shortage must adopt steps aimed at reducing the domestic demands and must make mandatory stockpile withdrawals. Provision has furthermore been made that, in handling these emergency situations, national structures be set up, so-called NESO (National Emergency Sharing Organization) which are charged with supervising all operations necessary for the equitable distribution of products (calculation of reduction in supplies, reduction in demand, allocation and reallocation of quantities which the respective countries must give or must receive).

The exercise consists in simulating the unexpected materialization of a supply reduction involving one or more sources of origin, during a predetermined span of time, and then setting in motion the balance-restoring mechanism, following a rigid operations schedule.

After the Agency has reported the presumed reduction in supplies from specific sources, the national NESO calculates the consequences regarding the country's supply situation, adopts the presumed reduction of domestic demand which must be more or less significant depending upon whether the shortfall reaches 7 percent or 10 percent of the country's needs, it finally calculates the country's deficit in terms of products and that is reported to the Agency to start the possible allocations of products from other member countries, something which will be handled through the secretariat of the agency.

The conduct of this exercise regarding Italy is assigned to the Italian NESO, an agency for handling emergency situations within the AIE, established under the Ministry of Industry and headed by the director-general of energy sources, made up of officials from the ministry and experts.

For the necessary calculations pertaining to the reduction in supplies and the subsequent decisions to be adopted, the NESO uses the information system of the national petroleum establishment which has an electronic data processing machine.

Regarding assumptions in the reduction in the demand, NESO moves along the lines of the petroleum emergency plan which, by the way, is in the approval phase.

The exercise begins on 1 October with the arrival of the telex from the Agency which has reported reductions in supplies for some types of crude chosen at random.

In addition to the emergency plan provided by AIE standards, Italy has ordered--as a commitment assumed toward parliament--the preparation, by the 30th, of the national petroleum emergency plan to be rendered operational in case of a noticeable reduction in the availability of crude or products. That plan is filed with the office of the prime minister.

The declaration of a state of emergency is up to the government in response to a report from the Permanent Technical Committee for Energy, in accordance with DP [Presidential Decree] of 10 August 1979, published in the GU DELLA REPUBBLICA [Legal Gazette of the Republic], No 224, dated 16 August 1979.

In accord with the anticipated requirements, the administration establishes a CIE (Interministerial Committee for the Emergency) chaired by the premier or one of his deputies and consisting of the following:

minister of industry, commerce, and crafts;
minister of interior;
minister of defense;
minister of foreign affairs;
minister of finance;
minister of state participations;
minister of foreign trade;
minister of budget and economic planning.

The premier may on his own call upon the ministers in charge of other ministries to join.

The ministers can be represented by their own deputies.

The CIE is the highest body that establishes objectives and provides policy indications according to which the emergency has to be coped with.

The CIE uses the following agencies:

The ST (Technical Secretariat);
The CCC (Central Committee for Energy Emergency Coordination).

The ST (which is what the NESO is to the AIE in its exercises) is the technical agency which arranges for the necessary documentation, the studies, and the reports on whose basis the Interministerial Committee and the Central Committee can adopt the proper decisions.

In particular:

(1) Presides over the optimum distribution of available resources as a function of the various sector and territorial requirements on the basis of the territorial distribution of products during the preceding year;

(2) It proposes measures for holding consumption down and consumption reduction levels in line with the indications supplied by the CIE;

(3) Is the body which transmits the decisions adopted by the central organs toward the outlying organs for the purpose of implementation, formulating provincial distribution plans, and it also checks into the precise implementation of the directives issued;

(4) In the pursuit of the objectives given by higher agencies, it drafts assumptions on the various effects of refining operations and on the various product availability levels; it then issues directives to the operators regarding the processing procedures to be implemented, depending upon the products whose availability is to be increased to the maximum possible extent, also analyzing the economic consequences as far as the operators are concerned, deriving from the technical decisions that were made;

(5) It analyzes and provides steps regarding user behavior in all consumption sectors and it arranges for technical steps necessary to achieve demand reductions in line with momentary product availability;

(6) It drafts procedures so that products made available in the various consumption sectors will be allocated to those entitled to them on an equitable basis;

(7) It consists of offices and structures under the Directorate-General of Energy Sources and Basic Industries, Ministry of Industry, Commerce, and Crafts, made up of 30 experts in specific fields of competence.

The CC consists of representatives from each of the following agencies:

Office of the Prime Minister,
Ministry of Industry, Commerce, and Crafts (which chairs the committee),
Ministry of Foreign Affairs,
Ministry of Interior,
Ministry of Defense,
Ministry of Foreign Trade,
Ministry of Transportation,
Ministry of Merchant Marine,
Ministry of State Participation,
Ministry of Budget,
Ministry of Agriculture and Forestry,
State Petroleum Industry,
Private Petroleum Industry,
National Association of Chemical Industry,
National Association of Petroleum Trade,
National Agency for Electrical Energy,

General Confederation of Italian Industry,
worker labor union organizations.

The structure proposed is supposed to be flexible and possibly suitable for expansion or reduction in line with specific requirements that might arise.

The CCC presides over the coordination of all operations necessary to handle the emergency. In particular:

It indicates the requirements and needs of the various energy absorption sectors in order to achieve the best efforts designed to reduce the relative demands while complying with the objectives drafted by the CIE;

Together with the ST, examines the various savings alternatives and ways of holding the demand down;

Verifies the compatibility--with the international situation--of steps adopted on the domestic market, devoting particular attention to compliance with the directives coming from international organizations (EEC, IEA).

In the CCC, there is a Board made up of representatives of each of the following agencies:

Office of the Prime Minister,
Ministry of Industry, Commerce, and Crafts,
Ministry of Foreign Affairs,
Ministry of Interior,
Ministry of Foreign Trade,
Ministry of State Participations,
Ministry of Budget.

The Board continuously--with permanently assigned officials--assists the ST so as to facilitate maximum coordination of operational functions with subsequent unification of authority.

CDP (Provincial Distribution Committees) are furthermore constituted in each province.

They are made up as follows:

prefectures,
chambers of commerce, industry, agriculture, and crafts,
provincial industry, commerce, and crafts offices,
government petroleum company,
private petroleum company,
provincial ACI,
industrial union,
provincial agricultural inspectorates,
petroleum product wholesalers,
port authority (where necessary),
civilian motor vehicle department inspectorates.

The CDP have a twin function:

Consultative, in spelling out local needs in relation to various absorption sectors;

Control and coordination regarding the implementation of procedures ordered by the central agency.

If necessary, they can also draft local distribution plans while staying within the total quantities allocated.

The CDP are presided over by the prefect who also has the job of making sure that the individual offices supervising possible sector restrictions on consumption do their assigned job.

Here is the diagram illustrating the planned organizational structure.

Key: 1--CIE (Interministerial Energy Committee); 2--CCC (Central Committee for Emergency Energy Coordination; 3--Board; 4--ST (Technical Secretariat); 5--CDP (Provincial Distribution Committee).

Procedures for Holding Demand Down Relative to First Phase of Emergency

At the moment a state of emergency is declared, it is necessary to make sure that the measures to be adopted and the intiatives to be launched in holding the demand down and, in the most serious case, the complex organizational procedures (identity documents, ration cards, etc.), are ready in advance and are distributed to the various provinces.

The activities here are organized according to the type of action required:

Prompt action with initiative of administrative type for less serious cases, amounting to less than 6-7 percent;

Action that can be taken with the help of more complex steps from the structural and organizational viewpoint, to be launched in serious cases, accounting for another 10 percent; two assumptions were formulated here, that is, 12 percent and 15 percent.

In each case, regardless of the type of step to be taken, it appears indispensable first of all to exercise control both over the price system and the level of crude, the products, and the conditions prevailing in the refining system. Regarding the first point, prices, it appears necessary in case of crisis to make sure that we have a system that will allow the domestic operator to level off the return on his crude in line with the average European price quotation. The method approved by the CIP at the end of last year guarantees this constant condition.

On the second point it is necessary to look into the status of crude and product stocks, the anticipated arrivals over the next 3 mouths, and the progress of refining capacities.

The measures to be taken, including those designed to hold the demand down, will be considered according to the seriousness of the crisis and in the light of the particular consideration to be given to the production sectors.

If the consumption estimate for 1980 should be around 103.5 million t of crude, we could figure out various assumptions regarding crude reductions and hence production reductions.

(1) In case of a 7-percent reduction, assuming a corresponding drop in the availability of raw materials, we would have a generalized shortage situation involving all products, in particular 1.87 million t of gasoline, approximately, about 1 million t of medium distillates, and about 7 million tons of fuel oil.

The gasoline shortage also includes the LPG share for automotive vehicles whose availability should be intended to cover priority needs (cooking, heating).

These shortages, where they arise, could be covered through various types of steps:

(a) Industrial Sector:

It seems that a shortage of fuel oil could be made up through imports, considering the level of domestic prices substantially in line with international prices;

(b) Transportation Sector

In short-range terms, one cannot assume any steps that would reduce the mobility of commercial transportation (freight transportation) which is substantially run on gas-oil.

For gasoline we have two possible assumptions:

The first one involves the use of a tax in order to introduce a drastic although temporary reduction in consumption;

The second one involves a limitation on the use of private cars.

In the first case, one would have to recall that an increase of 25 percent in the final cost produces an albeit temporary (6-month) reduction of consumption presumably estimable at between 15 and 18 percent.

In the second case, recent surveys indicate a consumption of about 40,000 t/day in the light of the current daily average.

The objective of holding the demand down to the extent indicated can be achieved by assuming a partial shutdown of traffic movement during some holidays or by introducing the odd-even tag system for all holidays.

The implementation of the second case however calls for the printing and distribution of signs certifying the days on which the driver has decided not to do any driving.

(c) Heating Sector

The shortage in medium distillates appears to involve quantities that are not excessive, on an annual basis, while it is of considerable significance in seasonal terms.

The shortage anticipated on an annual basis should be figured at around 1 million t; to cope with this, using ready-action steps, it would have been inevitable to restore and tighten up the clock-time restrictions.

As a matter of fact, by reducing all of the heating system turn-on times by just one hour, to the exclusion of interval F for the Alps and by reducing interval D by 2 hours (substantially in Central Italy), we achieve an average reduction of 1 hour for the entire national territory, dropping from the current 13.5 hours to a little less than 12.5 hours on a national average, with a saving that can be estimated at about 80,000 t per month of gas-oil and 10,000 t per month of fuel oil.

(2) In case of a reduction in crude supplies beyond 10 percent, for example, 12 or 15 percent, all of the shortages turn out to be considerably more emphatic, so that short-term steps appear to have hardly any effect while it is necessary to launch real emergency measures for various petroleum products or production sectors.

Assumptions on Cutbacks in Presumed Crude Supply (000/t)

	1 Programma 1980		− 7%			− 12%		
	2 Resa	T.E.P	3 Disponibilità	4 Fabbisogno	5 Diff.	3 Disponibilità	4 Fabbisogno	5 Diff.
G.P.L.	2.0	2 070	1 930	2 050	− 120	1.820	2 050	− 230
Benzina V. Naphta 6	18.6	19 250	17 950	19 700	− 1 750	16 930	19 700	− 2.770
Petroli/Gasoli 7	29.0	30 000	28 000	29 000	− 1 000	26 400	29 000	− 2 600
Olio Combustibile 8	40.5	41 900	39 100	45 900	− 6 800	36 850	45 900	− 9 050
Altri 9	3.5	3 600	3 380	3 920	− 540	3.190	3 920	− 730
Total	93.6	96 820	90 360	100 570	−10 210	85 190	100 570	−15 380
C - P	6.4	6 680	6 140			5 810		
Totale greggio 10	100.0	103.500	96.500			91.000		

Key: 1--1980 program; 2--Yield; 3--Availability; 4--Need; 5--Difference; 6--Gasoline, naphtha; 7--Petroleum, gas-oil; 8--Fuel oil; 9--Miscellaneous; 10--Total crude; GPL--LPG.

(a) Industry Sector

The fuel oil gap would appear to be about 8-10 million t; the entire deficit would appear to be difficult to make up from imports since this is a very high ceiling to begin with. It is therefore believed that imports could take care of about 7 million (t) as was stated in connection with the earlier reduction assumption. The difference of about 1-3 million t could be partly covered by the adoption of steps tightening up on the clock time spread illustrated earlier (240,000 t) as well as other steps in electrical energy distribution to reduce the demands for fuel oil to be used by the power plants.

This would slow production activities down, stopping those sectors that consume most energy or closing down industrial plants for one day per week, without spelling out any priority criteria but with the sole exception relating to continuous [production] cycles.

(b) Transportation Sector

While it is true that we must not reduce commercial traffic by limiting the use of gas-oil, looking at gasoline it has turned out that the shortage can be made up by tightening up on administrative measures dealing with traffic movement as such; In that eventuality it would seem necessary to stop traffic on holidays during the year.

(c) Heating Sector

The shortage in medium distillates can be partly made up by implementing the step calling for tightening up on the clock time interval or by limiting the number of days when heating systems can be turned on.

This means that it is necessary in all parts of the country--with the exception of zone F in the Alps--to reduce the duration of heating by at least 2 hours per day 3 hours per day in zone D (for example, Rome, from 12 hours down to 9 hours).

We would need inspection mechanisms and pertinent penalties to maintain this level of reduced heating system use.

It is obvious that the clock time intervals yield savings also in methane consumption; but that does not mean that we should refrain from introducing rate schedules which would discourage excessive consumption levels that would furthermore have to be indicated, also considering the fact that this source is used primarily for autonomous purposes and in combination with sanitary and cooking uses.

To avoid massive use of electric heaters, it is necessary to introduce a rate schedule revision which would radically discourage--during the winter season--consumption at levels higher than the average for the preceding year.

The level now reached in the arrangement of instruments and the definition of structures as well as agencies presupposes a very short time frame for the implementation of a valid action system in response to emergency situations.

It therefore appears all the more useful and advisable for the government--as the first step in its existence--to arrange the necessary technical means for handling such an assumption (establishment of committees, arrangement of forms and ration cards, distribution to the prefectures, the regional offices, etc.).

5.2. Production Processes with High Electrical Energy Consumption

5.2.1. Costs of Electrical Energy in Heavily Energy-Consuming Sectors

The effect of the electrical energy purchase price on production costs is of particular importance to industries with production processes necessitating a heavy energy consumption, where the cost of electrical energy accounts for between 20 and 50 percent of the cost of products sold.

This category primarily covers industrial establishments dealing with electrolytic zinc, abrasives, iron alloys, metallic silicon, magnesium, chloride of soda, alumina, oxygen, etc., whose production processes consequently are very sensitive to any rate variation.

The production of primary aluminum on the other hand is something entirely different; it likewise involves a high energy content but here we have had a freeze on rates and on the heat surcharge on the level of January 1978, thanks to which the average price of energy purchased in recent years has remained stable at around 17.50 L/kwh [lire per kwh].

Following the modest increase in the heat surcharge ordered by the CIP on 13 June 1980 (directive No 34/80), this price went up to 19-20 L/kwh.

For the other industrial establishments listed, the total average price today is 40 L/kwh, following the CIP directive of 44/80, dated 8 August 1980, in other words, below the average price deriving from the application of normal rate schedule processing (48-49 L/kwh) and in other words due to the easing of restrictions on the heat surcharge allowed for production processes involving more than 7,000 hours of power utilization (CIP directive No 25/75 and No 35/80), as well as the

introduction of the new multi-hour rates for high-voltage energy supply (CIP directive No 44/80).

In recent years, the industrial establishments involved repeatedly argued that, in spite of the easing of restrictions mentioned, they must pay higher prices--for the electric energy supplies they are getting--than those paid by industrial establishments in the particular sector in the other countries of the EEC. Because of this situation, Italian producers would run the risk of being progressively forced into a noncompetitive situation with possible negative consequences on the output and on employment levels.

5.2.2. Rate Comparisons with Other EEC Countries in 1979 and 1985

Rate schedule comparisons, based on published prices, are possible among the major partners of the EEC only with France and Great Britain since the electrical industries of West Germany do not publish their rates for power supply beyond 4,000 kwh which in practice would exclude almost all of the operators in the sector we are talking about here.

As of October 1980, looking at an average price of about 40 L/kwh that has to be paid in Italy by an industrial establishment with a power use of 25,000 kw and utilization of 7,500 hours per year, the rates charged by EDF [French Electric Power Company] in the various parts of French territory give us an average price of 34-37 L/kwh while the British Power Company charges an average price of 51-54 L/kwh. As we can see, the total price that has to be paid by Italian companies is not much higher than the French rate and considerably lower than the average British price.

But it must said that both in France and in Italy, along with the official rates generally applied to the user, there are also reports of special conditions (more favored treatment) to the benefit of individual industrial establishments which are heavy energy users. We cannot estimate the amount of these facilitations which generally are established from one case to the next very often in return for reciprocal services rendered by the users involved (past cessions of production plants, pledge to hold energy use down during peak hours, etc.).

Assuming the above, if we want to come up with some estimates as to the development of electric energy prices in Italy and abroad over the next several years, we have to keep in mind that the actual situation, in which the electrical industries of the various countries operate, exert different influence on the respective operations, thus causing a differentiation in the cost level with which the rate schedule systems tend to line up.

Among the elements that would help us diversify the operation of the service (production structures, financing terms, etc.)--which in general find the Italian electrical industry in a definitely unfavorable position--the makeup of primary sources used for the production of electrical energy assumes great significance.

As we said in Chapter 2 (Paragraph 2.4.5.), in order completely to obtain the objectives of this Plan, the structure of the Italian production system will remain different as compared to that of the major European partners, particularly

regarding the contribution from hydrocarbons production to meeting the total electric energy needs (see diagram 2.5./2.).

With reference to 1979, the Italian hydrocarbons output share comes to about 61 percent of the total domestic output as against 25 percent in France, 25 percent in West Germany, and 17 percent in Great Britain.

Projecting the situation until 1985, the greater use of hydrocarbons in Italy also appears more marked. The estimates for that time as a matter of fact show that energy produced with the help of hydrocarbons in Italy will cover about 65 percent of the total output, as against 8 percent in France, 14 percent in West Germany, and 13 percent in Great Britain.

This different production structure may be caused by delays that have piled up in the site location of new nuclear and coal power plants but it does place Italy in a situation of greater dependence on hydrocarbons as compared to the other countries where we find a high rate of nuclear and coal power plant output; this means that the production cost of electric energy in Italy and hence the rate level are destined to rise progressively in terms of time to a greater extent than in other countries, in relation to the high price dynamics connected with the energy source prevailing in Italy.

In this connection it must be disclosed that the guidelines of the Plan regarding the choice of production sources, with a substantially greater use of coal and nuclear power, can no longer modify the situation outlined for 1985--which therefore can be considered practically finalized--although they can still have a positive effect on the national energy situation such as it shapes up for the nineties, considering the technical time frame tied to the construction of new plants.

In order better to analyze the consequences of the different production structure, for example, in comparison to France, we note that the average variable production cost of the ENEL (costs due to fuel alone and related to every kilowatt-hour produced) today already by more than 8 lire exceeds the price charged by EDF. In 1985, this difference will be about 15 lire per kwh, due to wide French use of nuclear production which will be counterbalanced by a percentage-wise even greater use of fuel oil in Italy. These estimates relate to average fuel prices during the first half of 1980 which have an effect on production costs i Italy for each kilowatt-hour at the power plant output to the extent of 7.25 lire for nuclear power, 18.9 lire for coal, and 41.5 lire for fuel oil.

As we said before [illegible] Italian situation can be improved only during the last years of the current [illegible] it turns out to be possible to carry out the program for the construction of [illegible]lear and coal power plants included in the Plan. The country's dependence on the production of electric energy from hydrocarbons can be reduced to about two-thirds of the current figure while the share of the less costly energy source, the nuclear source, will go up to around 15 percent.

The average cost of electric energy produced in Italy consequently could turn out to be less far removed from the figure in other countries of the European Community,

even though the latter in the meantime will have further increased their already significant use of nuclear production (1990, 75 percent for France, 36 percent for West Germany, and 19 percent for Great Britain).

We can thus detect a by no means short period of time during which Italian electric power rates should in overall terms tend toward a recovery of service costs although they are currently, looking at industrial users, lined up with the average European levels so that we can say that they are destined to rise higher than those of the major EEC countries.

This situation is bound to have negative repercusions on the production costs of the various industries with high energy content and on their level of competitiveness.

Table 5.2/1. Difference between Anticipated Cost To Supply Industries with High Energy Content during the Period of 1981-1985 Compared to Rates in Force (13 August 1980)

1 Anni	2 Alluminio primario		3 Altri processi ad alto contenuto energetico		Total	
	4 Milioni di kWh	5 miliardi di lire	4 Milioni di kWh	5 Miliardi di lire	4 Milioni di kWh	5 Miliardi di lire
1981	4.300	132	4.200	61	8.500	193
1982	4.300	158	4.200	89	8.500	247
1983	4.300	187	4.200	120	8.500	307
1984	4.300	220	4.200	155	8.500	375
1985	4.300	256	4.200	194	8.500	450
	6 agevolazione media annua c.a 190 miliardi di lire		7 agevolazione media annua c.a 125 miliardi di lire		8 agevolazione media annua c.a 315 miliardi di lire	

Key: 1--Years; 2--Primary aluminum; 3--Other processes with high energy content; 4--Millions of kwh; 5--Billions of lire; 6--Average annual funding [loan facilitation] about 190 billion lire; 7--Average annual funding about 125 billion lire; 8--Average annual funding about 315 billion lire.

5.2.3. Actions To Be Taken

The activity of industries with heavy electrical energy consumption will be estimated within the context of industrial policy and, more generally, the economic policy of Italy; and in this context we must consider the possible support efforts which the nation as a whole can take upon itself for the purpose of not bringing about excessively heavy dependence on the import of semiprocessed products.

In the light of an examination of available statistics, companies that are heavy energy consumers require a power output of 1,200 Mw and consume about 11 percent of the energy supplied by ENEL within the industrial sector (about 70 billion kwh in 1980).

If, to stop the growth of costs paid by those industrial establishments, the rates and heat surcharges paid by them should not exceed variations compared to the level

in effect as of 13 August 1980 (in other words, after the issue of CIP directive No 44/80), considering the funding already operative (about 145 billion lire per year, including 110 to push the production of primary aluminum), we would have a growing expenditure which can be estimated at about 315 billion lire per year, as an average for the next 5-year period (Table 5.2./1.), if the demand for power and the quantity of energy consumed are not increased.

This estimate takes into account the effects of inflation and the probable rises in the international cost of fuels, moderated by the anticipated increase in the productivity of the electric power sector.

This therefore brings up the need for a program decision regarding industrial sectors with heavy electric energy consumption which could not be in a position to take any further price increases as compared to the current levels which already seem to create difficulties in some cases.

In substance, the important thing now is to define the optimum output levels for the industries mentioned (aluminum, magnesium, zinc, iron alloys, abrasives, etc.) and to launch support efforts in favor of such industries, to be sustained by the nation as a whole, so as to compensate for the higher cost of electrical energy in Italy as compared to the costs which the international competition has to pay.

5.3. Rural Electrification

The problem of electrification of rural homes not supplied with electric energy was tackled for the first time on a combined and coordinated basis in 1965.

The ENEL is conducting a survey to identify homes, to ascertain the number of inhabitants, and to bring out the significant elements connected with this situation.

Following this survey, the national government first of all and then the regions will adopt steps to finance the new rural electric power networks.

The data resulting from the survey conducted in 1965 were as follows:

230,000 rural homes with 1,205,000 permanent residents;

110,000 rural homes in which the farmers stay usually only during certain seasons.

After the work started in 1968--for which the national government and the regions as of the end of 1979 allocated the sum of 306 billion lire (including 20 percent, amounting to 62 billion lire, taken care of by ENEL)--we had, as of the end of 1979, a number of homes without electric power in which we have a steady number of 317,000 inhabitants plus 335,000 inhabitants living in houses only seasonally.

Upon the exhaustion of funds allocated throughout 1979 and with the completion of the work in progress, it was estimated that the following situation would result:

45,000 homes with 240,000 permanent inhabitants (5.3 inhabitants per home);

70,000 homes with 300,000 seasonal inhabitants (4.3 inhabitants per home).

At the costs reported as of 31 December 1979, the financial commitment to complete rural electrification was estimated at 460 billion lire, with an average power connection cost of 4 millions.

Considering the increases in costs during 1980, the financial expenditure as of 31 December 1980 was reestimated at 543 billion lire (up 18 percent) which means that the average power connection cost will go up to about 4.72 millions.

It should be kept in mind that, for a certain number of homes still without electric power, we would have a power connection cost of less than an average of 4.72 millions, costs which however will go up considerably as the years pass.

An estimate has been made by assuming financing starting in 1980 for a period of 10 years and it was found that, with a commitment of 40 billions per year, it would be possible to electrify about 60,000 homes while a commitment of 50 billions per year could enable us to electrify about 65,000 homes.

Naturally, these estimates take into account not only the fact that the program would be started with lower-cost power connections but also the assumptions concerning the progress of inflation.

For this latter reason it is necessary to keep in mind that any possible delay in the program's financing could lead to a smaller number of homes that can be electrified even if the funding itself remains the same.

It must be noted that studies and experiments are in progress concerning the development of small solar energy generating units--particularly with photovoltaic cells--which could be used in rural electrification in those cases where the cost of power connections would be so high as to make the use of the latter equipment worthwhile. These studies are already in an advanced stage and an experiment will be launched next year to supply a rural home, not yet electrified, by means of photovoltaic cells.

5.3.1. Action To Be Taken

To carry out the above program it will however be necessary, through a suitable law, to provide for the allocation of the necessary funds, keeping the current distribution of costs, precisely, with 80 percent to be borne by the regions and 20 percent by the ENEL.

For autonomous power supply, using renewable energy sources, which we mentioned above, we are going to use the funds allocated in Bill 655.

5.4. Environmental Protection

5.4.1. Current Situation

The problems concerning the environmental effect of the various energy sources are particularly important in Italy because of the heavy population density and the heavy concentration of production activities and urban settlements in the existing plains and along the coastlines. It must be noted that environmental protection

standards progressively adopted in Italy devoted particular attention to the problems of fitting the energy plants into the environment properly with particular emphasis on thermoelectric power plants.

5.4.1.1. Current Reference Standard Framework

Atmospheric environmental protection

We currently have in force Law 615, dated 13 July 1966, and pertinent Implementing Regulation for Industrial Establishments, No 322, dated 15 April 1971, which among other things establishes concentration limits on ground level for SO_2, NO_x, and dust.

For thermoelectric power plants we furthermore have in effect an ad hoc Law (No 880, dated 18 December 1973) which provides for more restrictive limits for ground-level concentrations of SO_2 in areas around power plants. Besides, Article 6 of that law prescribes: "Around every thermoelectric power plant...it is necessary for the ENEL to install a double network of chemical and meteorological monitoring instruments with double terminals, adequate density and extent, suitable for disclosing the ground-level concentration of contamination coming out of the plant itself."

"The network...consists of measurement instruments which make possible continuous and systematic measurements with immediate transmission of results to the two terminals, as well as suitable statistical data processing.

"One of the two terminals is available to interested local agencies which have free access both to the network and to the second terminal assigned to the ENEL, as well as the instruments mentioned under the second subparagraph.' It must be underscored that the mandatory installation of chemical-meteorological measurement networks in Italy is confined to thermoelectric power plants. The above ground-level concentration limits (SO_2 and dust) are in line with those established by air quality criteria from the WHO, as well as those contained in the recent directive issued by the European Community, which, as we know, must be used as the standard for all member countries, as well as the limits in force in the other industrialized countries (see Paragraph 5.3/1.).

Law 615 furthermore establishes the maximum sulfur content allowed in fuel (3 percent for fuel oil, 1 percent for steam coal); this is tantamount to fixing the limits for emissions of sulfur anhydride from thermoelectric power plants. The current restrictions on emission therefore turn out to be much more restrictive for power plants burning coal. (Article 9, Law 393, dated 2 August 1975, provides for limited periods of time--unless there is an opinion to the contrary from the Ministry of Health--that the Ministry of Industry can authorize the ENEL in case of need to use coal with a sulfur content of up to 2 percent. But that provision so far has not been applied in practice.)

Protection of Water Bodies

We currently have in force Law 319, dated 10 May 1976, governing discharges and dumping of any kind and hence also discharges by energy plants. The limits provided for in this standard, particularly regarding thermal discharges, are substantially

similar to those in other European countries and in some cases (for example, Great Britain, France) they are even more restrictive. This law was included in Law 650 (24 December 1979).

Protecting the Environment Against Ionizing Radiation

The effects of ionizing radiation are considered on an international level by an appropriate agency of the UN, called UNSCEAR (United Nations Scientific Committee on the Effects of Atomic Radiations) and the ICRP (International Commission on Radiological Protection) which has been operating in this sector since 1928.

The recommendations of the ICRP are received and expressed in the form of directives by EEC. The Italian standard (DPR [Decree of the President of the Republic] 185, dated 13 February 1966 and pertinent implementation documents) and the implementation procedures as such are completely in line with the EEC directives and the ICRP/UN recommendations.

Environmental Impact Documentation for Thermoelectric Power Plants for Authorization Purposes

Reports concerning the environmental impact in connection with conventional and nuclear thermoelectric power plants have gradually become standard practice over the past decade.

As a matter of fact, Article 4 of the previously mentioned Law 880, dated 18 December 1973, establishes that: "Plans for thermal power plants for the production of electric energy and the pertinent high-voltage transportation networks must be submitted by the ENEL to the Ministry of Industry, Commerce, and Crafts, backed up by adequate technical documentation for the primary and secondary infrastructure facility plan and with particular emphasis on measures to safeguard health and the environment, also with reference to noise, vibrations, and water, including the systems for atmospheric contamination determination."

MICA, in its directives, furthermore requires an opinion form the Central Commission Against Atmospheric Contamination, consisting of the president of the region involved and two members of the Regional Committee Against Atmospheric Contamination.

For thermoelectric power plants of the nuclear type likewise, within the context of the procedures provided for under Law 393, dated 2 July 1975, and in agreement with the Ministry of Industry, assisted by the CNEN, the Ministry of Health, the regions, and the other competent authorities it is necessary to document--regarding site location and construction permits--those aspects of environmental impact which are not governed by DPR 185.

Article 4, Law 393, establishes in particular that the ENEL must transmit to the Ministry of Industry and to the regions concerned a report with complete documentation on the locations proposed and on the pertinent technical and environmental characteristics.

The above environmental impact reports call for the early collection of basic data on meteorology, hydrology, ecology, as well as social-economic and other factors.

The environmental impact studies, both for conventional plants and nuclear plants, in particular involve the immissions from air-like and liquid discharges into the atmospheric environment and into water bodies; they are accomplished with the help, where possible, of data from experimental investigations on the environmental effect deriving from other representative plants already in operation and above all with the help of those mathematical and sometimes physical estimate models considered most reliable also on an international level.

The frame of reference for the acceptability of the environmental impact thus identified is furnished by the environmental standards included in the previously mentioned laws now in force.

The environmental impact reports also indicate all of the steps which are planned to guarantee--during the plant's operation--compliance with environmental parameters and with the limitations contained in the standards for environmental protection (water, air, noise, etc.).

We furthermore find spelled out here the characteristics of the environmental parameter sampling networks or measurement methodologies (air, water, noise, etc.) in areas around the plants, with particular emphasis on data processing methods.

Where pertinent, we furthermore have a description of possible ecological on-the-spot survey programs, designed to document the conservation of environmental resources (for example, hydrobiological checks on water bodies) in terms of time, before and after the construction of the plants.

In addition to the steps specified in the standards currently in force, it has become constant practice to furnish the interested authorities and the local entities with data collected by the systems and programs for environmental control in areas around plants, so as to arrive at a common treasury of knowledge.

The aspects pertaining to the procurement and utilization of environmental surveillance data are usually inserted in suitable agreements which, within the framework of standards in force, regulate relationships between the plant's managers and the local entities in terms of construction and operation of the plants themselves.

Standard Reference Frame for Petroleum Cycle

Protection of Water Environment

As we know, petroleum has always been a subject of maximum attention regarding environmental pollution; it was therefore among the first to be regulated during all the various phases of its cycle, from extraction to consumption.

To keep track of the cycle starting with prospecting and pumping of crude, we must recall DPR 886, dated 24 May 1979; although it was added relatively recently, it finally provided some important standards in a matter which is extremely difficult to regulate.

Activities pertaining to transportation of petroleum products, especially on the sea, were the first to be the subject of an international standard, starting in 1954 (IMCO Convention).

Successive amendments in that convention made it possible to perfect this standard to the point where we had the 1973 IMCO Convention and the additional 1978 Protocol.

Regarding more particularly Italy's geographic area, that is to say, the Mediterranean Basin, a standard of a general character, plus five specific protocols, was agreed upon and signed by all riparian countries (Barcelona Convention, 1976).

Finally, any type of discharge coming from refining and storage activities, has been regulated in Italy by Law No 319, dated 10 May 1976, and by successive amendments, which finally led to the passage of Law No 650, dated 24 December 1979; this law among other things provided for the definition of the financial instruments which are indispensable for better and faster implementation of the law, at the same time determining the deadlines for the attainment of the predetermined environmental protection targets which can no longer be postponed now.

Overall, looking at the refining sector, the objectives established in Italy by the law were attained and in some cases exceeded.

Protection from Atmospheric Contamination

The prevention and control of atmospheric contamination in Italy is regulated by the previously mentioned Law 615, dated 13 July 1966. This law regulates emissions with a check on fuels employed and it obviously applies also to all refineries. Although this was not explicitly required by the law, the principal refineries have been equipped with atmospheric contamination sampling and control systems in areas around the perimeters of the establishments.

After the entry into force of Law No 833, dated 23 December 1978, concerning the establishment of the national health service, by way of compliance with the provisions of Article 4 of that law, within the Ministry of Health, quality standards are now being drafted for the principle air pollutants, in the light of the studies and results obtained nationally and internationally.

In the case of SO_2 and dust, these standards will obviously be the same as those provided for in the EEC directive on the limitation of SO_2 and dust concentration in the atmosphere, issued earlier, in connection with which we are drafting a national law for specifications and practical implementation.

Lessons Learned in Conventional and Nuclear Thermoelectric Power Plant Operation

Compliance with environmental protection standards and hence the adoption of pertinent systems are constantly being looked into by means of the systematic collection of experimental data. In this connection we recall that we currently have operating in Italy 19 ENEL monitoring networks of which 15 are used to sample the air quality around as many conventional thermoelectric power plants and four networks around nuclear power plants. The processing of the vast volume of chemical, meteorological, and radiometric data has made it possible to acquire knowledge in this field which, in terms of volume and depth, is absolutely in the lead on an international level.

The networks generally are supplied with a printing terminal for the local government agencies, entirely similar to the one at the power plant, where the data are received continuously and in real time.

An environmental radio activity sampling network, managed directly by CNEN, has been operating for quite some time on the national level.

The data from the national network are combined with the monitoring data done on the local level also by the ENEL and by other agencies, since all of the data are then sent on to the CNEN and are periodically published in bulletins.

We also have various air quality and water quality as well as seismic networks operating on national territory and they are managed by agencies and institutions such as the regions, local government, CNEN, CNR, Higher Health Institute, National Geophysics Institute.

In this way we have progressively created a common treasury of data and knowledge on active and stimulating cooperation among local agencies and authorities concerned, including first of all those which supervise public health and hygiene. Concerning conventional thermoelectric power plants, the data collected indicate that we have generally attained the objective of holding immissions on ground level down, regarding pollution agents currently regulated between values that are within the limits of the current standard, as well as current air quality standards put out by the WHO. In Italy it is necessary to achieve similar results for coal-fired power plants, given the role assigned to them under the PEN; however, the first results coming from the monitoring networks around power plants burning coal have been furnishing indications similar to those mentioned above.

Regarding finally the nuclear power plants, the experimental results derived from the surveillance networks and the periodic inspection programs carried out around current operating plants confirmed that the radiation and radionuclides levels produced by the power plants have always been a small fraction of the variations of the natural background values between various parts of the country, in other words, they are definitely lower than the limits specified by law.

5.4.2. Actions To Be Taken

Concerning the energy plants, the current reference standard framework is substantially suitable for permitting early implementation of the national energy program; in particular, all of the specifications and environmental safeguards turn out to be on a level similar to those of the other European countries as far as the thermoelectric power plants are concerned.

Naturally it will be necessary to introduce all those steps that are designed to minimize the overall environmental impact also on the basis of technological and information-gathering experiments which may gradually become available.

In a more general context, however, it must be noted that the Italian situation in the matter of norms, standards, and control technique structures in the area of environmental impacts deriving from all human activities throughout national territory calls for a process of updating, rationalization, and completion.

In particular we must in Italy have organic environmental protection legislation which will impose standards and procedures designed to permit an overall approach to the subject of prevention and control of interactions between industrial and urban areas and the various environmental spheres.

Having said this, it will be necessary to develop, in the energy sector, a complex of technical actions which will assume diverse aspects as a function of the characteristics and the requirements of the individual energy sources (coal, natural gas, nuclear fuel, petroleum, renewable sources, and energy savings).

In general, to improve the capacity for the prevention and control of air-like and liquid contamination, as well as the disposal of solid waste, it will be necessary heavily to step up research, study, experimentation, and demonstration activities in order not only to develop in depth and extend our knowledge regarding the behavior and effects of the various contaminating agents but also to improve the existing decontamination technologies, as well as to develop and perfect new processes and technologies which look promising.

In the following we will list the main activities to be launched over the next 3 years; they will call for adequate steps in terms of the funding of that portion which deals with the specific responsibilities of the various levels of government. Naturally, investments for environmental protection pertaining to energy plants will be included in estimates dealing with the individual energy sources.

(A) Actions Pertaining to the Production and Use of Individual Energy Sources

Coal

The large-scale use of coal calls for an operational effort in the environmental, health, and social sectors, using the best possible technological solutions which moreover have already been broadly adopted worldwide.

Regarding operational activities that can be launched immediately, priority attention will be devoted to the following aspects:

Description of coal of various origin, in terms of commercial product quality, for environmental purposes;

Minimizing the dust content during the transportation, storage, and handling phase involving coal and pertinent territorial restrictions;

Description of emissions and immissions of air-like agents of environmental and health significance and application and development of technologies for the control, reduction, and disposal of pollutants and resultant solid products;

Study and optimization, from the environmental viewpoint, of the various disposal methods for ash, including re-use systems;

Specific environmental aspects of coal from Sulcis;

Landscape aspects of infrastructure facilities and plants.

The following must be considered for the correct development of the above operational, immediately applicable activities:

Many of the environmental aspects of coal-fired power plants do not differ from those already determined and widely acquired for domestic power plants burning fuel oil. Some of the aspects however are different;

The environmental aspects of the Italian coal utilization program therefore can be developed in depth and can be analyzed in the light of experience that can be used nationwide. For those not available in Italy, particular attention will have to be devoted to the lessons learned in other countries of the European Community, operating within a territorial and social-economic context similar to that of Italy, with decades of experience available on the environmental aspects connected with the use of large volumes of energy coal. (We might recall that, in 1979, Great Britain in its thermoelectric power plants used 86 million t of coal, West Germany used 40 million t of coal and 120 million t of lignite, while France used 25 million t of coal.)

This wealth of knowledge can represent a point of departure for active and dialectical cooperation between control authorities (including those which on the national and local levels supervise the area of public health), local government agencies, and the National Electric Power Agency;

On the basis of what we have said above, it turns out that current techniques for using coal in thermoelectric power plants have been tested and are backed up by extensive experience; that also applies to plants and systems for ecological protection and for environmental impact studies.

Naturally, studies for the optimization of environmental decontamination and protection systems will have to be conducted and developed as a function of the specific territorial and environmental context found in Italy.

The problem of disposing of ash can, through further work, give rise to positive developments in the field of recovery for industrial, agricultural, and civilian uses in various areas, currently leveled, as well as the creation of new areas in the proximity of crowded port zones through ocean fills. We could thus reduce the extraction of natural materials from caves and from the beds of water bodies which has caused and which currently is causing serious environmental problems.

In medium-range and long-range terms, it seems a good idea to continue with research and development activities aimed at advanced coal utilization systems, such as gasification, fluidized-bed combustion, etc.

This research and development activity as a matter of fact can be properly justified from the environmental viewpoint, since it might potentially enable us to introduce improvements concerning the environmental impact deriving from conventional coal burning techniques.

Petroleum

The production and use of petroleum, for which in Italy especially we have vast experience and which, as stated in the paragraph pertaining to the standard reference frame, have been the subject of intensive national and international standardization activities directed against contamination, nevertheless do present ecological problems which must be studied in depth and which must be solved.

Here we want to make special reference to environmental impact, understood in the "overall" sense and pertaining to all activities in the petroleum industry. An old standard (Article 16, Single Health Law) is still in effect and provides some criteria for guidance in the replacement of unhealthy industrial establishments, including refineries, for the purpose of preventing any damage to the health of nearby residents.

This standard however is certainly not sufficient in tackling the ecological problems deriving from refineries as a whole.

An environmental impact directive, considering all aspects of the problem, is currently being examined by the EEC, as illustrated earlier.

In this context, immediate actions are aimed at the acquisition of ever better knowledge and the in-depth development of the above-mentioned problems, especially with reference to the following phases of the petroleum production and employment cycle:

(a) Exploration and production, with particular reference to offshore deposits;

(b) Maritime and land transport of crude and petroleum products;

(c) Petroleum refining;

(d) Combustion of petroleum products in automotive vehicles, civilian, public, and industrial plants, in electric power plants;

(e) Description of fuel, in terms of product quality, for environmental purposes;

(f) Landscape aspects of infrastructure facilities and plants.

[6 Feb 81, pp 123-132]

[Text] Energy Plan--VIII. In this issue we conclude the 5th and last chapter of the National Energy Plan.

Natural Gas and LPG

The production and use of methane and LPG presents problems which are in the nature of security and reliability rather than environmental impact. The combustion products as a matter of fact are substantially devoid of contaminating substances.

However we must mention actions pertaining to environmental and sanitary aspects, connected with the prevention of accidents, in other words, a subject which falls within the purview of the safety control authority in the following phases of the natural gas cycle:

(a) Methane transport by ships;

(b) Regasification plants;

(c) Distribution and use.

Nuclear Energy

In the field of radiological protection for the population and in the radioecological field connected with the placement and operation of nuclear power plants, a vast data and knowledge base has been acquired and that also applies to Italy. However, keeping in mind the objectives of the PEN and from the viewpoint of constantly updating our knowledge, we must proceed according to the following main directions, keeping in mind that the problems of nuclear safety, as well as those pertaining to the handling of radioactive waste, were taken up in Chapter 3.3.:

(a) Refinement of scientific and technical level acquired in the determination of the environmental impacts of nuclear activities in general, above all regarding plants involved in the fuel cycle; further in-depth development of effects of natural radioactivity;

(b) Refinement of analysis and evaluation capacities of multiple environmental characteristics found in Italy in order to arrive not only at specifically point-oriented findings--which the CNEN-DISP [National Safety and Health Protection Directorate], the regions, and ENEL will have to carry out on the nuclear site map--but also the evolution of standards;

(c) In-depth development and completion of knowledge on the ways in which radioactive elements circulate in nature and on the critical ways toward the biosphere and man in particular.

(d) Completion and assembly of potential inherent in the metrology of ionizing radiation, microdosimetry, individual dosimeters, and environmental components;

(e) Development of research topics in line with what is being done on the international level, regarding the effects on the body and the genetic effects on damage deriving from external radiation and internal contamination, above all at small doses, on immunity reactions [immunoreactions], and on the problems connected with inhalation of aerosols and particles;

(f) New activities in the field of epidemiological surveys.

(g) In-depth development of environmental aspects pertaining to the uranium mineral prospecting, mining, and processing phases, minimizing the radiological exposure of the people and the workers;

(h) Systematic arrangement and monitoring of uranium mineral processing wastes in medium-range and long-range terms, minimizing radioactive and conventional contamination of the environment.

A further contribution will have to be made through the development of a unified central nuclear project also regarding the liquid and air-like effluent treatment and purification techniques.

The construction of standard power plants, for which all of the technological improvements available at the time will be included in the blueprints, will make it possible to introduce further reductions of environmental effects which even now are negligible and to optimize the inspection and control activities regarding the surrounding environment, permitting the better statistical utilization of data and experiments thus obtained also in the field of epidemiological surveys.

Renewable Sources

The action lines for information-gathering and operational activities are oriented as follows:

Solar Energy

In-depth study and description of environmental aspects, such as land use, landscape, environmental impact of heliostats, possible microclimatic changes, contamination problems connected with production of semi-conductors and, in general, materials used in plants, etc.

Wind Energy

In-depth development and description of aspects concerning land use, landscape, noise and vibration problems, possible microclimatic changes, etc.

Geothermia

In-depth development and description of aspects concerning land use, liquid gaseous emissions as well as the pertinent landscape aspects, study of possible soils subsidence phenomena and possible induced microseismic activities, etc.

New Hydroelectric Power Plants

Continuation of specific surveys of an environmental and social-economic character.

Utilization of Solid Wastes as Fuel

Continuation of research for prevention and control of atmospheric contamination, as well as on problems of waste disposal in line with the rate variability of waste in terms of commercial product value.

(B) Efforts Concerning Further Energy Sources

Expansion of Environmental Monitoring Activities

As part of an effort to check on environmental parameters throughout national territory, it appears to be a good idea to extend monitoring activities, currently limited to areas around electric power plants, to the refineries and to some industrial establishments as well as some regional initiatives. It is furthermore necessary to plan the types of surveys and the levels of authority of the various agencies and institutions that will operate both on the central and peripheral levels. It is necessary finally to standardize the information items which must flow toward a national data bank, not only to give us a systematic and general knowledge of the quality of air, surface and underground water, as well as the soil throughout the national territory but also to furnish indications on the best action strategies in the environmental and territorial management fields.

One important aspect is the link between the national, regional, and local levels which is why we need a pertinent standardization effort involving technical methodologies used in measuring and surveying as well as sampling and a standardization effort in the [data] processing field.

Operational Instruments for Reduction of Overall Environmental Impact Deriving from Establishment of New Energy Plants

In order to improve the quality of the environment it is essential for us to act selectively with respect to the main factors that influence the environmental characteristics of a specific zone. From that viewpoint, and wherever possible, we can take positive action regarding the environmental situation of an area where a big energy plant is to be established, working on other environmental disturbance factors which sometimes in a decisive fashion influence the overall situation of the zone itself (for example, domestic heating).

For this purpose, regarding thermoelectric power plants, DDL 702 of 1979 appears to be a useful instrument since it makes available to interested communities rather considerable funds which can be used on a priority basis for important improvement efforts such as, for example, the establishment of long-distance heating networks.

Environmental Aspects of Combined Electrical Energy and Heat Generation

On the basis of experimental data gathered, also through the sampling survey networks, it has been possible to ascertain that atmospheric contamination is generally concentrated in metropolitan areas and reaches its maximum levels during the winter because of the decisive contribution from urban heating. This aspect is particularly significant since more than 50 percent of the population are now concentrated in 33 metropolitan areas (constituting only 8.3 percent of national territory). In that situation, the combined production of electric energy and heat for urban heating in inhabited population centers looks like an important instrument for heating areas with heavy contamination.

Preliminary reference projects indicate for example that, from a couple of plants of 320 Mw (which is one of the sizes standardized by the ENEL), it is possible to

extract heat to meet the basic long-distance heating needs for a number of inhabitants between 60,000 and 100,000, depending upon the weather conditions and characteristics, plus a certain very valuable primary energy saving (natural gas or gas-oil); through the above-mentioned form of joint generation we should be able to obtain ground-level SO_2 contamination indexes that ought to be lower by several factors of 10 than those deriving from a conventional heating solution.

It is therefore necessary to promote these applications in all situations where they turn out to be feasible and justifiable also in economic terms, likewise through the construction of new generation plants. It is furthermore necessary to make sure that the heat distribution networks will be so built as to minimize the negative effects on the normal activities of urban areas involved, such as they derive from construction work.

Disposal and Use of Waste Heat from Thermoelectric Power Plants

The disposal of waste heat is handled through the transfer of heat itself to the biosphere, to receiving water bodies, or directly to the atmospheric environment (open-cycle or closed-cycle cooling systems).

The in-depth investigations conducted in Italy at thermoelectric power plant sites both along the coast and along the middle Po showed that these power plants, which have been operating for many years, in the current situation did not cause any significant changes in the structural and dynamic characteristics of the components of the water ecosystems involved.

These results--combined with the most recent worldwide scientific production pertaining to similar experimental field investigations--enable us to reconsider the problem of thermal changes from a by no means preoccupying viewpoint with respect to the viewpoint which has so far influenced public opinion. It is nevertheless necessary to keep in mind the future development of the total thermal load, especially regarding inland water bodies; in relation to the construction of new plants in this context it is a good idea therefore to develop the collection of data and experience in order to document their compatibility with the water ecosystems involved also in connection with plants to be put up shortly. This fact-finding effort will take shape as we document compliance with the limits included in current standards for the protection of water bodies.

Considering the current state of knowledge, the promotion of activities involving the use of waste heat in the field of agrothermia and thermal water cultivation is therefore being viewed as a positive contribution not so much toward the solution of environmental problems but rather toward the better utilization of heat resources with a low intrinsic value which the worsening energy crisis tends to upgrade.

In particular, experimentation in the above-mentioned fields in Italy likewise enables us to think that it will be possible in a short time to identify the ways in which we can use the waste heat deriving from specific situations existing in Italy as a function of the weather conditions, the sales chains adopted, and the means available as well as the local situations.

Concerning direct discharge into the atmosphere, through moist cooling towers, to be employed when we cannot guarantee compliance with standard limitations for heat discharges, it is necessary, with the help of specific projects in Italy, to acquire data and experience on the environmental effects (change of local climate and landscape, possible spread of chemical additives into the atmosphere, supply of drainage water, noise).

It furthermore appears to be a good idea to continue to step up studies and/or experiments on new dry cooling systems and above all systems of a mixed type (dry-moist and moist-dry) developed in Italy and abroad in order to minimize the environmental impact.

Possible Environmental Impact from Energy Savings Measures

Some measures aimed at energy savings can, in addition to benefits, also produce effects on the environment and on the health of the population. In implementing these measures, we will have to take these effects into account, such as, for example, caution in the adoption of certain heat insulation agents, need to guarantee good air exchange, problems connected with emissions from automotive exhaust, etc.

(C) Study and Research Dealing with Topics of General Interest

A different development line involves the tendencies, currently expressed in the world of science, among the political and social forces, and in vast public opinion strata toward a better definition and expansion of the concepts and criteria of environmental protection involving alll human activities and hence also in the energy field.

While attention so far has been focused mostly on various contamination agents, the currently prevailing approach is more systematic and also includes aspects such as use of resources and land as well as social-economic aspects.

It will therefore be necessary to take this tendency into account by arranging, launching, and broadening study and research programs in the fields in question so as to supply adequate and documented answers rather early with a view to minimizing the overall environmental impact.

Overall Environmental Effects of Energy Systems

The purpose of this undertaking is the progressive acquisition of knowledge, analysis and evaluation, from the viewpoint of the ecological, health, and social-economic effects of entire systems comprising all phases of the energy source cycle of interest to the country, to wit: nuclear energy, mineral fuels (coal, petroleum, natural gas), and renewable sources (water, solar, wind, and geothermal energy), as well as energy savings measures. It is therefore necessary to start the collection and systematic analysis of knowledge and data made available due to experiments in the field and research projects both abroad and in Italy. Here it is necessary to start a flow of information which will have to come both from energy operators and from the technical and control agencies of the regions and other localities and from other social and association components involved,

including institutes and scientific laboratories as well as national monitoring facilities. It is furthermore necessary to identify and develop homogeneous methodologies of basic data acquisition for evaluation studies (an effort facilitated by the hoped-for availability of national data banks, as well as valid and standard criteria for the analysis and evaluation of systems, and also to take into account the specific nature of the Italian situation and the various parts of national territory.

Another objective of these research efforts is the identification and evaluation, also in economic terms, of the various possible technological solutions in order to identify ways to minimize the overall environmental impact of each energy system.

This systematic approach furthermore will enable us to acquire guidance elements for planning our research on ecological, biomedical, and technological topics and hence to tackle the problems on the basis of data and criteria of homogeneous analysis and evaluation which in turn at the same time will promote the focusing of the debate on the objective elements.

The results of the studies which will progressively become available are going to be made available to the people as a whole and to the interested government agencies, the social and political structures, with particular reference to regional and local organizations.

Distribution and Behavior of Contaminants in the Environment

Various agencies and institutes (CNR, CNEN, Higher Health Institute, ENEL, public and private laboratories, university institutes) are conducting research--including advanced research--in this field. It is as a matter of fact in particular necessary progressively--through broad-scale experimental research and in specific areas--to acquire greater knowledge on the distribution and environmental circulation characteristics of toxic substances and elements. It must furthermore be kept in mind that the basic knowledge, which we have on an international level (which, by the way, is likewise being developed further) cannot simply be taken out of context and shifted to the specific environmental situations which we encounter in Italian territory. To permit the intensification of the above-mentioned activity, we will have to boost and adjust the operational and organizational framework for research and we are going to have to coordinate programs involved in the Energy Plan.

Toxicological and Epidemiological Studies

As part of human activities in the industrialized countries (transportation, industrial production, including energy generation), more and more attention is being devoted to the effects, upon man, of the quantity and concentration of potentially toxic substances even though they may just be small.

Research in this field is in progress at the Higher Health Institute, the CNEN, the CNR, public and private laboratories and university institutes. But this knowledge is still rather scant, given the multiplicity of possible long-range and widely varying effects of substances together with different action mechanisms.

Finally we must systematically tackle the problem of interaction between various toxic substances on different levels of contamination.

Parallel to the great international effort recently launched toward the acquisition of those basic data it is necessary for us in Italy to realize the need for launching an effort aimed at adequately responding to the above-mentioned protection problem complex.

Research and discoveries of an epidemiological type must furnish sufficient factual elements on the frequency and seriousness of morbid forms which are spontaneous or which can potentially be tied in with the effects of the various toxic substances from the various sources.

5.4.3. Environmental Aspect Issue Development Line

As we know, a EEC directive was approved in December 1979 concerning "Health Protection Norms against Sulfur Anhydride and Particles Suspended in the Atmosphere."

This directive spells out the target limits for ground-level concentrations of sulfur oxides and dust which the member countries must include in their national standards.

All of the EEC member countries therefore, concerning the above-mentioned contaminants, will have homogeneous air quality limits also regarding the introduction of huge energy plants into the environment.

We currently have in the EEC approval phase an agreement among the member countries regarding across-the-border, long-distance contamination. This agreement among other things provides for a commitment on the part of the member states to undertake concerted research and/or development activities in the field of reducing emissions of sulfur oxide or other contaminants, with particular emphasis on the field of existing technologies, their applicability and yields and their repercussions on the environment.

Various industrial countries have established standards for air and water quality, as in Italy, and standards for the disposal of solid waste and the use of plant resources and services with reference to plants of various kinds, deriving from production activities, including those relating to energy transformation. In some countries furthermore there is underway a process of revision and updating of the above-mentioned environmental criteria and standards in the light of past experience, new technologies that have been made available, and the results of surveys and recent research efforts relative to all pollutants.

It therefore seems to be a good idea to keep track of the evolution of guidelines, criteria, procedures, and environmental standards established in the individual industrial countries and on an international level; the idea is to speed up the revision and development of quality and service standards to complete and develop national and regional standards within an organic reference frame.

Naturally, work on standards cannot be divorced from the commitment to update and boost the institutional, legislative, organizational, and financial instruments.

Finally, it is necessary to keep in mind that an EEC directive draft is now under review, calling for the preparation of a report on the "evaluation of the environmental impact" (VIA) for every industrial project of a certain size.

This procedure--which calls for the above-mentioned report to be prepared and to be submitted to control authorities, as well as consultation of inhabitants in the area involved--therefore also applies to the big energy production plants.

Beyond the time necessary for formal approval of a directive of the type in question, we can anticipate that reports of the above-mentioned type will progressively be introduced also in Italy, as a natural development of what is now being done. Indeed, as we saw in an earlier paragraph, we have already moved in that direction within the context of licensing procedures for big energy production plants in Italy.

From the lessons learned earlier we can derive some indications which must be kept in mind as we look forward to new developments; we saw that this activity must be based on some operational instruments, such as:

(a) Availability of a current data bank, collected in a systematic, unified, and organic manner, so as to arrive at an "x-ray" of the territory, viewed here as a service available to the community;

(b) Adoption of criteria and methodologies--as standardized as possible--for the drafting of environmental impact statements; such criteria and methodologies, established by the control authorities through suitable technical instructions, are going to have to be acquired properly and will have to be implemented consistently on the operational level by the public agencies and authorities involved on the national, regional, and local level in procedures pertaining to the examination and evaluation of environmental impact statements, in other words, to avoid waste of funds and delays in licensing times.

Looking ahead, we therefore need an effort to put together and boost public structures designed to produce the necessary data in the hydrographic, meteorological, geological, and seismic sectors, in the sector of provincial chemical laboratories, in the sector of the description and analysis of complex ecosystems, in the sector of public health and epidemiological surveys, etc.

The development of the above-mentioned activity appears necessary also for the formation of a public consensus on the methodological criteria for site locations and on the pertinent environmental guarantees. We must as a matter of fact so far report not only a persistent lack of confidence in the use of basic data but also a certain lack of uniformity in studies on the methodologies to be employed in connection with the environmental impact statement and its validity.

A particular effort will therefore be made to the benefit of the citizens and public opinion.

Environmental impact statements tend to introduce an overall approach to the evaluation of environmental effects.

This overall approach therefore can constitute a good factor toward the synthesis of all areas of competence and sector safeguards contemplated within all of the standards currently in force in the area of protection for the atmospheric environment, water bodies, soil, etc. This can eliminate the difficulties in terms of instructions and authorizations inherent in the sector structure of our current national environmental protection standards--although this is something which is commonly found in most of the industrialized countries.

Another parallel development line pertains to the incorporation of various environmental aspects into the framework of technical evaluation and control agencies, both on the central and on the local levels. This tendency in some cases is already at work. For example, Article 101, DPR No 616, dated 24 July 1977, provides that the Regional Committees for Atmospheric Contamination should also take on regional functions in the matter of acoustic, water, and soil hygiene through suitable integration into their area of authority.

From what we said earlier about the current institutional and standard setup in the matter of environmental protection, it follows that this setup is compatible with the conduct of actions provided for under the Energy Program regarding the environment; it is also capable of accommodating the developments and improvements we stressed earlier. Nevertheless, on a more general level, comprising all human activities, we need an effort to arrive--even if only gradually--at a more organic setup of environmental impact prevention and control procedures to be applied to all activity sectors and through the entire national territory.

The evolution of institutional, legislative, organizational, and financial instruments active in the field of environmental protection and control (with reference to air-like and liquid, stable and radioactive pollutants as well as solid wastes) must lead to greater harmonization, rationalization, and boosting on the national, regional, and local levels also through census and survey of technical-scientific authority and the operational potential of structures currently existing on the national, regional, and local levels.

In this sense it is necessary--parallel to the activities provided for under the plan and without introducing any delays in plan implementation times--to develop a specific operational framework provided with the necessary scientific, technical, and administrative authority, built around national, regional, and local structures.

The authority of these agencies could, on the national level, include an agency with functions dealing with general guidance, basic knowledge development, development and issue of standards, criteria, and environmental standards, guidelines and procedures; it could also provide for the general verification of the implementation of standards, norms, and laws, comparision, between laboratories, of measurement and control methodologies in making certain types of inspections, as well as the systematic collection of environmental data (data bank).

Tasks on the regional level would include the implementation of norms, the planning and coordination of actions (including checking on the reports on the environmental impact situation following the operation of certain plants), looking into compliance with standards and, generally, norms applied through local agencies, the ability to request the national agency to provide specific forms of cooperation

or directly to carry out certain controls, as well as the publication of reports on environmental quality and cooperation in the development of national norms.

This assumption regarding the distribution of tasks among agencies on a national, regional, and local level naturally will be developed in depth with the participation of all technical, social, and political components concerned.

Regarding the national agency for prevention and control of environmental impact, we substantially assume an "ad hoc" agency (for example, like the EPA in the United States, the Federal Environmental Bureau in Germany, and the Canadian "Environment Canada"), created in line with legislation in force in the matter of environmental and health protection, including the health reform law and the technical-scientific and control authorities which have arisen (ISS [Higher Health Institute], CNR, CNEN).

Naturally, all of the actions outlined above will then call for adequate steps toward financial coverage for all of the environmental control activities for which the government agencies concerned are responsible.

5.5. Energy Information

5.5.1. Current Situation

The demand for information in the energy field is very broad and involves both public opinion and its social ramifications.

In spite of the work being done by public agencies such as the ENEL, the CNEN, and the ENI, the demand does not seem to be fully met.

This situation is due, on the one hand, to a condition of general uncertainty in civilian society as a whole regarding the aspects of energy problems and, on the other hand, it is due to the difficulty the public institutions are having especially on the local government level.

This points up the importance of a broad and wide-open information drive as a prerequisite for effective popular participation, in all of its social and political ramifications, both in the debate and in the implementation of subsequent decisions.

5.5.2. General Objectives

The problem of energy development involves technological studies and decisions, as well as social and economic aspects which entail significant objective and subjective implications for civilian society since energy is a primary factor in economic growth.

Because of these implications, the ultimate purpose of an energy information program must be as follows:

Contribute to the process of forming that awareness of energy problems which is the foundation of objective evaluations in this matter and hence of aware and responsible choices;

Promote the decision-making process in the political establishment, the government agencies, and the industrial establishments, according to lines of social rationality and with the necessary consensus.

Regarding information topics, they must be identified to cover the vast areas reflecting the entire broad range of decisions in the matter of energy and activities and operational methods with which they are carried out.

A first area involves energy strategies, the needs that they must satisfy, the surrounding conditions that must be complied with, and, more generally, information and knowledge on the basis of which the strategic decisions must be made.

This area includes the following:

Topics relative to the worldwide energy problem, to the interrelationships of the energy system between countries, to correlations between energy development, industrial development, and the people's living standard;

Topics relative to energy needs and their connections with economic development alternatives for the country, with Italian industrial strategy, and with the GNP;

Topics pertaining to alternate energy choices for Italy and, within the context of decisions made, topics dealing with investments in research and development as well as industrial promotion intended to support these decisions and, finally, the energy industry programs that have been drafted.

A second area of topics concerns the implementation of energy programs and hence the operational conditions which must be complied with, as well as the efforts designed to influence the behavior of the individual citizens toward greater awareness of efficient energy use.

That area includes the following:

Analysis of the real social-economic situation in which the energy systems are located and the impact of site locations relative to the environment (contamination and safety, surveillance, action plans), production activities (utilization of heat, participation in construction), the territorial setup (special efforts to develop the area, urban development projects and housing projects), and induced developments (plants and factories to supply parts and materials);

The general and special aspects concerning the plants, both during the site selection phase and the construction phase as well as during the operational phase, and in particular, the processing of licenses and technical and administrative inspections, accompanying the construction and management of plants themselves, geared to the goal of safety;

The methods of planning and construction employed by the construction industries and the management methods used by the operating agencies and, more generally, technical aspects pertaining to the energy sector;

Information for correct choice and use of equipment and systems employing energy in order to achieve efficient energy use.

5.5.3. Action To Be Taken

Roles and Responsibilities in the Dissemination of Energy Information

The orientation in the selection of information topic areas, involving the entire decision-making and operational process in the energy sector, enables us to identify a plurality of agencies responsible for the dissemination of information destined for civilian society and its information media.

As a matter of fact, each information area is paralleled by agencies which, operating in the sector with differing and complementary responsibilities, can--in correspondence to their institutional function--assume the task of disseminating those reports of a technical and administrative character which are specifically within their area of competence since they are tied to the fulfillment of their role and since they therefore have adequate credibility in the eyes of public opinion.

Supplying information is a duty of the agencies and enterprises that have authority and responsibility in the matter of energy.

In order properly to guarantee complete information supply, we must have a plurality of sources which the government, as the executor of energy policy, will provide in order to direct and coordinate the entire effort, with the collaboration of ENEL, CNEN, industry, RAI [Italian Radio and Television], etc.

Energy Information Dissemination Criteria

The information drive must be in line with the criteria of objectivity and clarity so that the citizens may be able to come up with their own personal independent evaluation.

In this connection:

The information must be disseminated continuously to permit adequate assimilation processes;

It is necessary to meet the requirement for early information supply in the transmission of reports, in connection with events which from time to time may provide an opportunity for such information.

Information activities must be allocated guaranteed adequate funds in support of the above activities;

It is necessary to step up cooperation with communications media operators (radio, TV, the press, etc.) which furthermore will have to intervene with full autonomy and according to the typical characteristics of professional operations.

Specific Efforts

It is a good idea to launch specific initiatives which will make it possible to start the information process as outlined.

To this end it is necessary to activate specific instruments, such as:

Creation of permanent information centers at the energy plants;

Boosting or creation of documentation and information centers open to the public, to be run by the agencies, enterprises, and institutes, also in collaboration with local government.

Utilization of the constituent regional committees, the ENEL, CNEN, as provided for by the CIPE, for information purposes;

Initiatives by agencies aimed at local government levels with particular emphasis on regional administrations.

5.5.4. Conclusions

The dissemination of information, as illustrated in this outline, must be a contribution to the country's democratic life and therefore does not constitute a premise for the establishment of a monopoly or a concentration for this type of activity.

We considered it important to put the problem in the proper context and to outline the main topics.

Above all we wanted to show that information must be circulated and must be documented.

Finally, we want to invite all subjects, both public and private, who are involved in the entire energy topic complex, to realize what the problem really is and to act accordingly.

In conclusion we wanted to evidence the government's commitment to this topic and its coordinating and directing function in this respect.

5.6. Research Activities in Support of PEN

5.6.1. Current Situation

To attain a large part of the objectives spelled out in the PEN, we need a coordinated complex of research activities which will feature all of the operational capacities of the public entities, the public and private industrial establishments, and the research agencies. While not overlooking the spontaneous aspects of research, it is however necessary therefore to channel these activities toward the plan's objectives. In this way, experimentation with technologies in the start-up phase and the identification of new technologies can have a reflection upon the plan's objectives and can draw new orientation from them.

The dimension of the energy problem and the need to tackle it with a technological capacity adequate for a sufficient number of possible solutions demand that we undertake--in addition to the activities mentioned above--coordinated research efforts which, while being tied in with the objectives spelled out in the plan, will either have prospects of consistent application only in the future, or call for a risk margin in the results to such an extent that we cannot accept their success as a basic condition for meeting the energy demand anticipated during the time span considered by the plan.

A detailed definition of objectives and deadlines, of money necessary and operators concerned with all of the research on energy topics will be collected within the PNRE which is in the drafting phase under the coordination of the Ministry for Scientific and Technological Research.

This plan deals with the 1981-1985 5-year period and will be presented to the CIPE by the end of 1980. The plan will prescribe the research programs already approved for the various operators and will furthermore include additional action necessary to attain the predetermined objectives and to get the financing needed for the latter.

In assuming that the PNRE should be viewed within the more general framework of the Energy Plan, it will become necessary to start close cooperation between the PNRE and the PEN, considered above all as a link between administrative structures responsible for implementation. To guarantee maximum effectiveness of efforts spelled out in the PNRE, it will be indispensable to conduct periodic checks on results, within a maximum interval of 3 years each time, so as to constitute the necessary basis both for corrections, inclusions, or extensions of financing, and for a correct definition of the research and development strategies.

Suitable instruments should for this purpose be arranged in a concentrated manner between the responsible administrations.

5.6.2. Results of Fact-Finding Investigations on Energy Research

The collection of data regarding the status of implementation of research activities already started and in line with the objectives of the plan, for the purpose of a timely evaluation of compatibility and congruity therefore assumes particular significance as an element of connection with the current situation.

From the analysis of data collected by the MRST [Ministry of Scientific and Technological Research] through a vast survey on current activities in the energy research field on national territory, we can derive some overall indications which will be reported below.

The total value of research work surveyed so far does not include activities in the nuclear field (in progress, in the planning stage, in the study stage) and comes to about 1.22 trillion lire with an average research figure of a little more than 1 billion, with 33 percent going for personnel and about 230 billions already spent, overall.

The use of in-house financing by industry is figured to account for around 50 percent of the expenditures.

In 40 percent of the cases, joint participation by various entities is either in progress or hoped for.

In terms of percentage value of the total financial commitment, the research involves 20 percent heat conversion, 18 percent electrical conversion, 6 percent mechanical conversion, 5 percent chemical conversion, 11 percent treatment and collection, and 14 percent model studies, instruments projects, statistical surveys, etc. (it has not been possible to define the remaining percentage figure 26 percent because it was not declared or because it was not clearly declared). Only 26 percent involve recovery problems and even less (14 percent) involve accumulation. Applied research prevails with 51 percent over basic research with 2 percent and over experimental plants with 47 percent.

Among final uses, industrial uses prevail, along with domestic and commercial uses (20 percent each).

5.6.3. Action Prospects

Looking at the current situation in the energy research field and considering the objectives of the plan until 1990, research efforts are bound to reveal a picture of broad diversification in terms of direction. Nevertheless, it appears necessary to establish priority indications for those sectors which, because of their inherent significance and because of the early timing of action, call for priority implementation.

Research efforts will have to tend to guarantee the technological options of the more long-range energy objectives and will have to allow domestic industry to achieve an effective presence on the international energy market.

Some research lines were indicated in the earlier chapters both regarding the various sources (coal, nuclear, renewable, geothermal) and regarding use sectors (agriculture, buildings, production processes). It therefore turns out that, to attain research prospects in line with the plan itself as well as the long-term national targets, we must prepare a major commitment program.

The number of qualified personnel necessary will have to be estimated in line with the possibility of using resources currently earmarked for other research sectors as well as the contribution made by the existing engineering facilities regarding the accomplishment of activities inherent in the demonstration programs. Nevertheless, it appears necessary to provide for a significant increase in the number of personnel, even though this increase will realistically have to take into consideration the time necessary for proper training.

This program must in a coordinated fashion involve all available forces, that is, research agencies, industrial establishments, and universities.

The arrangement of the work of the various sectors, the details involved in fund allocations and personnel requirements, the indications as to possible operators

and the identification of control and coordination instruments on the national and decentralized levels will be presented after the introduction of the PEN within the current year by the MRST, as spelled out in the above-mentioned PNRE, for submission to parliament for its approval.

5.7. Institutional Aspects and Legislative and Administrative Instruments

5.7.1. Parliamentary Recommendations and CIPE Indications

The attainment of the objectives indicated, the implementation of policies and actions to be undertaken under the plan, both in the area of main energy sources and in the field of energy savings and efficient energy use, imply the solution of numerous problems connected with the institutional setup as the "key problem" in the entire national energy program.

The lessons of the seventies, the difficulties encountered in coordinating the actions of the various entities and central government agencies in the energy field, the failure to carry out the rationalization plans of the petroleum product refining and distribution plants, the delays in the placement and construction of energy plants--all this confirm what we have said in line with the complexity of problems and the aspects involved in energy policy and its implications regarding the country's economic and civilian policy.

On that crucial issue parliament and the CIPE have expressed themselves on several occasions:

(a) On the occasion of the first fact-finding survey promoted by the 12th Industry Commission in 1974 it was considered necessary to "establish an organizational management and implementation framework for energy policy" which required the definition of objectives, action lines, instruments, so as to coordinate the implementation methods and to control their actual implementation in a coherent and systematic manner.

On that occasion there was a proposal for the establishment of a High Commissioner for Energy, in other words, the concentration, in the Ministry of Industry of all authority in the matter of energy distributed over other ministries; the Ministry of Industry of course already has control over CNEN and ENEL.

(b) In approving the First National Energy Plan, the CIPE, through its resolution of 23 December 1975, to safeguard the various institutional aspects, provided --through the implementation of operational lines contained in the plan--more than 30 coordination steps between the various central government agencies, in spite of the fact that there was a great need to reorganize the executive branch in order to coordinate energy policy; on that occasion it was considered advisable to assign authority over all questions pertaining to that policy, on the parliamentary level, to a single permanent committee of the Chamber of Deputies and of the Senate.

(c) On the occasion of the second fact-finding survey carried by the Industry Committee of the Chamber in 1977, parliament again took up the problem by updating the energy policy outlines.

The 12th Commission urged the government to place the entire sector under a single authority on the executive level and on the level of a parliamentary committee, not only regarding the question of internal problems but also regarding the drafting of an international cooperation policy as the foundation of domestic policy.

Pending a general reform, emphasis was placed again on the need for making sure, within the current institutional setup, that such a single authority would be identified in the Ministry of Industry and would be equipped with an adequate technical-scientific consultation body.

Looking ahead however it proved to be necessary to establish a Ministry for Energy whose essential functions might be as follows:

Draft national energy policy;

Work out multiannual and annual activity plans in terms of objectives, programs, production, development of resources and structures, and supervising their implementation;

Directing and coordinating the operators who perform their action in the sectors of supply, production and utilization, research and development, safety and protection for plants;

Promoting and coordinating cooperation relationships with foreign countries and government agencies in agreement with the Ministry of Foreign Affairs.

(d) In the course of the debate on national energy policy, which took place in parliament between 28 September and 5 October 1977, the conclusions of the second fact-finding survey of the Industry Committee of the Chamber of Deputies were confirmed. The Chamber of Deputies as a matter of fact emphasized that "in order to give the country a stable and continuing energy policy it is necessary and urgent to give the entire energy sector a single and coordinated management on the executive level and on the parliamentary level."

(e) The second edition of the Energy Plan, approved by the CIPE on 23 Decmeber 1977, once again, from the administrative angle, took up the coordination of energy policy and institutional problems.

In stressing the urgency of institutional modifications, which reduce energy policy to a single administrative body, instead of the current plurality of decision-making bodies, the CIPE felt that this coordination, could be in the meantime taken care of by the Ministry of Industry, General Directorate of Energy Sources and Basic Industries, using civil servants from the Ministry of Foreign Affairs, Ministry of Foreign Trade, and Ministry of State Participations.

This makeup for the DGFI [Directorate-General of Energy Sources] was not possible because of the refusal or silence from other central government agencies when it came to making the recommended separation which had been assured on the basis of spontaneous cooperation between civil servants in the Ministry of Industry and and the other government agencies.

(f) Coordination of energy problems among the various government agencies (Foreign Affairs, Budget, State Participations, Industry, and South), during the prededing Cossiga Cabinet, was accomplished by the office of the prime minister by assigning the secretarial function to the Directorate-General of Energy Sources and Basic Industries.

5.7.2. Redefinition of Roles of Central, Local Government Agencies and Entities

The lessons learned above all since 1973 confirm the full urgency of a framework for policy management and for the direction of technical-administrative instruments charged with practical implementation since any other program setup would face the risk of remaining frustrated during the operational phase.

To continue the efforts listed in th lan, we believe it is necessary to work in three directions which will have to pire the overall activities of the central, regional, and local government agencies and the energy operators:

(1) Central nature of the energy problem and subsequent need for cultural growth of the level of awareness as to the problem's priority and the multiplicity of responsibilities for actual behavior both on the part of the central government administration as well as the regional and local government levels;

(2) Overall nature of project, understood in its double meaning: not only as a plurality of actions and sector choices closely correlated and interdependent, as the components of a single basic strategy, but also as a factor of commitment and involvement of all components of the national government and civilian society, from the government agencies to the regions and the local entities, from the public and private operators to all citizens;

(3) Specific nature of actions to be launched during the decade but in particular over the next 3 years in a context of gradual movement, continuity, and coherence of actions and steps.

The success of the efforts provided for in the plan is vital to the Italian economic system and presupposes the verification of functions assigned to the structures that must be enabled to operate efficiently with timely adjustments on the level of a realistic definition of roles assigned to the various sectors and subjects of energy policy, elimination of shortcomings of an organizational type, and updating of some procedures that proved to be unsuitable.

In view of the difficult problems arising from the seriousness of the crisis and the urgency of finding solutions, Italy on the one hand turns up with a public structure that is too much articulated and broken up, to the point of making it difficult to come up with a uniform decision for the whole setup, while, on the other hand, it appears to be too centralized.

The multiplicity of decision-making centers (central government agencies, regions with special status and regular status, local entities, committees, commissions), the plurality of public operators (who undoubtedly have great experience but whose tasks, although clear and well-defined at the time of their establishment, at least in some cases tend to merge, to be superposed upon each other, and to involve a

duplication of effort), the system of laws which are mostly outdated and which were passed prior to the creation of the three public agencies, as well as the launching of the regional organizational setup--all these make the solution of even relatively simple problems extremely complex and difficult.

The definition of an overall pattern for the energy institution setup requires a long time while the problems to be solved appear to be serious and urgent.

Since we cannot propose overall solutions for these reasons, we must right now launch a process of reorganization according to the lines indicated below with the objective of at least meeting some essential requirements:

(1) Identification of decision-making factors and authorities that will be obligatory for the entire energy system;

(2) Assigning to the public agencies and to public and private industry operators those roles which will guarantee or help guarantee the attainment of the plan's objectives;

(3) Participation of local entities, above all, the regions, at the most important decision-making moments.

5.7.3. Reorganization and Boosting of Political and Central Administrative Instruments

To meet the requirements listed, we propose the following:

(a) Establishment, within the CIPE, of a CIPEN (Interministerial Energy Committee), chaired by the premier and made up of the minister of industry--who will also be its vice chairman--and the ministers of budget, of state participations, of foreign affairs, of the treasury, and of foreign trade, with the task of spelling out overall energy policy and charting coordinated action lines between government agencies. The CIPEN will draft program indications together with pertinent methods and target dates in order effectively to pursue the energy policy objectives as such;

(b) Where the conditions anticipated in the energy emergency declaration should arise, the functions of the CIPEN should be assumed by the appropriate CIE (see Paragraph 5.1.);

(c) Expansion of tasks of CCIR which will operate under the CIPE and which, in the matter of energy, already has assignments pertaining to the programs of the ENEL and the siting of electric power plants; it will be called upon to express its opinion every time the Cabinet considers it necessary to make a comparison and to conduct an exchange between the federal government and the regions, with particular reference to the program outlines of the PEN and their implementation;

(d) Permanent Technical Committee for Energy, a consultation body of the Ministry of Industry, with the task of submitting proposals and instructions connected with the main program aspects of the energy sector.

On 10 August 1979, by virtue of DM [Ministerial Decree] No 7345, it consists of the presidents of the three public energy agencies (ENI, ENEL, CNEN) and three experts and it has the task of coordinating the actions of the various operators, evaluating the country's real energy needs, identifying the means and methods of meeting those needs, and looking for suitable actions aimed at achieving every possible energy savings.

Although the time since its establishment has been very short, its creation and operation came in response to a need for the more direct involvement of the public entities and for getting together with the plurality of social operators.

(e) Ministry of Industry, Directorate-General of Energy Sources, or Ministry of Energy, or Commissioner for Energy Problems. The various working assumptions presumably do not represent alternatives but rather successive phases in a process which can mature only step by step; the first step is represented by the strengthening and boosting of the existing DGFE which, during a second phase, could evolve toward a Ministry of Energy or, if considered advisable, it could in a further phase lead to a Commissariat for Energy Problems. Regarding the first point, we now believe that we have a sufficient general level of percentages in order to formulate some operational indications.

The tasks which the directorate is called upon to accomplish are spelled out on the one hand by appropriate laws and decrees (Law No 1433 of 15 December 1960, DM of 15 May 1963, and DM of 13 April 1973), and on the other hand by national energy programs approved by the CIPE on 23 December 1975 and 23 December 1977, or by the present document which is in the discussion and approval phase and which once again brought out the need for an organizational structure beyond the current size of the Directorate-General.

As of today, the personnel available to the directorate amounts to 107, including 49 officials from the ministry (including 24 university graduates), 10 officials from the Single Register of the Office of the Prime Minister (including five graduates), some in the process of being transferred to other government agencies, and 48 coming from public agencies where they held management positions (including only 9 graduates).

The CIPE resolution of 23 December 1977--which permitted the assignment of 50 personnel coming from public agencies to the directorate--helped restore a situation because the above-mentioned 48 individuals were already working for the directorate in March 1975.

From the provisions of the plan we can tell that there is obviously not only an expansion in assignments but also a change in the character of the directorate's activities.

From mostly administrative and action supervision tasks, the ministry had to go on to assume an important role in terms of planning and promoting initiatives--and it will continue to do so during the next several years--which calls for the acquisition of a new professional status which did not develop within an administration whose tasks were entirely different.

Considering the new subject matter so far not provided for under the authority granted (here it suffices to think of the conservation and energy savings sectors, alternate energies, development of methane, and use of coal for energy), it is believed that the directorate should be organized as follows in order to perform its functions:

Four deputy directors-general, respectively, responsible for the four basic areas: hydrocarbons (petroleum and methane); electric energy; nuclear sector; renewable sources and energy conservation;

Eight assistant ministerial counsellors with sector inspection assignments including liquid and gaseous fuels, petroleum emergency, nuclear, electric energy, methane use, coal, conservation and energy savings, solar energy;

Twenty divisions.

For further details, please see Appendix 5.7.A.

5.7.4. Role and Functions of Public Energy Agencies and Public and Private Operators

Regarding the entities, the evolution of the worldwide energy situation, the resultant continuous adjustments, the need for exploring new tasks and new methodologies do necessitate a moment of reflection in identifying the respective tasks and the necessary cooperation.

The original purposes of the entities and the lessons that have been learned however do raise some considerations here:

ENI: its fundamental role is confirmed here in terms of supplying primary energy sources for the country and in the management, although not exclusively, of the pertinent production cycles, such as refining and distribution for petroleum products, distribution of gas and coal, nuclear fuel cycle, energy services. Together with the ENEL, the agency is developing geothermal potentials.

ENEL: it must continue its priority effort of meeting the national electric power need, operating in such a manner as to reduce the use of hydrocarbons for the generation of electric energy progressively through increased employment of renewable energy sources (water, geothermal), coal, and nuclear energy, so as to permit the better utilization of plants with timely actions in terms of the demand.

CNEN: the institutional reform currently being examined by parliament confirms the role of the agency in the research, development, demonstration, and promotion of nuclear technologies and extends it to renewable sources and savings. The task of guaranteeing nuclear power plant safety and protection for the population and workers for the moment is maintained within the CNEN, pending its subsequent transfer, to be accomplished through an appropriate government law, with the necessary gradual implementation to avoid any drop in efficiency, in other words, assignment of this function to a new agency which will be established around the central directorate (DISP) which currently has this task assigned to it. The above-mentioned bill provides institutional approval for the factual autonomy which the

DISPE enjoys now and constitutes a first step toward a different institutional placement of the licensing and control authority.

The agency resulting from the separation of the safety and control activities of the CNEN must in a unified manner be entrusted with safety inspections over all "high-risk" sectors, thus planning the kind of public control which can gradually be extended to all activities that might potentially give rise to serious accidents. This solution emerged clearly from the work and conclusions of the Nuclear Safety Conference held in Venice and is quite in line with the pertinent EEC directive now in the process of final approval. The full implementation of the energy plan presupposes and facilitates the broadest possible rationalization of industrial and especially manufacturing activities; the effort in that direction, already launched with the involvement of Finmeccanica [Mechanical Engineering Finance Corporation] and other public and private industrial components should be continued toward its optimization.

With reference to the petroleum sector, there has been confirmation of the need to preserve the presence of the international operators and the private national operators taking into account their by no means secondary function in the country's energy supply.

5.7.5. Participation of Local Entities in Energy Policy and Territorial Resources Program Management Distribution-Making

Within the new frame of reference which we wanted to constitute, the regions and the local autonomous levels of government play an irreplaceable role in which they can tackle and solve the many problems of national energy policy against the background of common objectives and coordinated action on the various decision-making and participatory levels.

The regions and the system of autonomous government levels as a matter of fact reveal a complex of requirements tied to their authority in the matter of social-economic growth, territorial setup, environmental protection as well as health protection which interacts with energy problems.

In particular, the regions are called upon in an ever more complete and continuous manner to perform the following functions:

Joint participation in the big energy decisions and their implementation:

(a) By activating coordination mechanisms within the interregional commission also through an examination of the programs of the big energy agencies;

(b) Conducting consultations, on the regional level, regarding energy topics also through suitable conferences;

Intervention in the sector of efficient energy use and renewable sources; for this purpose, DDL 655 already assigns the regions significant tasks of providing incentives, tasks of promotion and control over actions planned there.

The lessons learned in the regions over these past several years are valuable and must be properly used.

Concerning specifically the site location of electric power plants, along with some positive experiences which must be properly used, it is necessary to reveal that in many other cases the noteworthy involvement of the regions and the local entities, provided for by legislation in this area, turned into a veto power rather than in a positive decision-making power, with negative results for the nation as a whole.

The plan's implementation is contigent upon the immediate launching of efforts involving site selection within tight target dates for all energy plants that have been planned, applying above all the norms now in force.

It is therefore necessary to do away with the above-mentioned paralyzing mechanism and to call upon the regions (which are quite aware of the absolute urgency of the problem) to make a greater and more specific commitment.

In this spirit and considering the role assigned to the regions as well as the publication of the "site map," intended as a map of areas suitable for power plant locations, buy the CNEN, it is possible better to define some procedural aspects involved in site selections for power plants possibly through the provisions of DDL 702 of the Senate.

Since the regions, prior to deliberating, must have technical data relative to the characteristics of the specific sites, it is indispensable for the ENEL to be authorized, by way of preliminary steps, to conduct the necessary surveys on areas suitable for such locations, as provided for by Artile 6, DDL 702.

Particular mention must be made of the contribution system provided for in DDL 702, for the financing of actions aimed at the utilization of available heat or hot water resulting from the electric energy generation process, as well as the safeguarding of the ecological assets through the establishment of services and projects which may be necessary both in strictly urban terms and in environmental terms; the construction of an electric power plant for instance could indirectly constitute an element toward the restoration of balance and the improvement of the existing environmental situation in overall terms as a result of the collateral action which this will lead to.

Concerning the communities, it is necessary to state that the contribution system provided for in their favor by DDL 702 and 393/75 increases their role by combining actions into a general process of development and rational systematization of the territory. The contribution payment mechanism moves in that line.

In the context of the objectives spelled out in the plan, the financial resources are in line with the objective of identifying and managing processes to be carried out in close collaboration between the local entities and the public and private operators.

[13 Feb 81, pp 154-159]

[Text] The Energy Plan--IX. In this installment, along with appendixes A and B, we conclude the publication of the complete text of the National Energy Plan.

Appendix A--Chapter 5.7.

Reorganization and Boost of DGFEIB

Directly under the 4th Director-General, we have deputy directors who are responsible for each of the four fundamental coordination areas, to wit: hydrocarbons (petroleum and methane), electric energy, nuclear power plants, renewable sources, and energy conservation.

(1) Deputy Directorate for Hydrocarbons

Division I. Petroleum supply (annual and monthly plan; imports and exports; distribution, relations with CIP; drafting and updating of measures to be adopted in case of emergency for petroleum product and derivatives supply and distribution; secretariat of Interministerial Consultative Commission on Petroleum Matters; surveillance of domestic petroleum and derivatives market; secretariat of Interministerial Consultative Commission on Petroleum Matters; surveillance of petroleum products market; commercial agreements; credit and financial questions; management of budget chapters for liquid fuels.

Division II. Supply and distribution of natural gas (implementation of methane development plan for the South, oil pipelines and methane pipelines, networks, etc.).

Division III. Processing and deposits of mineral oils (issue of licenses for installation and operation of plants for processing mineral oils; expansions and transfers of plants themselves; oil pipelines linked to refineries; transfers, as security, of semifinished petroleum products to plants which perform complete processing; stockpile control; mandatory strategic stockpiles of petroleum products; refinery processing plans; issue of licenses for installation and operation of mineral oil storage facilities; LPG; implementation of Law No 327, dated 21 March 1958, and Law No 7, dated 2 February 1973).

Division IV. Automatic fuel distribution plants and regional plans (issue of licenses for installation and operation of automatic fuel distribution facilities located on highways; rationalization of distribution networks; relations with regions and other autarchic territorial entities; secretariat of Interministerial Commission for Fuel Distribution, as provided for in Article 16, Law 1034, dated 18 December 1970.

(a) Deputy Directorate for Electric Energy

Division V. Relations with local entities and plants (relations with the autarchic territorial entities; plant site location; authorization for construction of thermoelectric, geothermo-electric, thermonuclear electric power plants; releases, clearances; transfers of electric enterprises to ENEL).

Division VI. Surveillance over ENEL, electric energy rates (general questions dealing with electric utilities; directives and actions under the purview of the CIPE; program report on ENEL activities; ENEL programs; surveillance over ENEL; ENEL balance sheets [budgets]; relations with national organizations and CIP in the matter of rates);

Division VII. Surveillance and control over in-house producers and companies under city control (authorizations for new in-house production power plants; license for local entities; budgets of entitites and electrical enterprises (Law No 151, dated 4 March 1959); authorizations for electric power generating groups).

Division VIII. Transportation and distribution (there is no objection to the construction of electrical energy transportation and distribution lines; authorizations for electric power generating groups).

(3) Deputy Directorate for Nuclear Energy

Division IX. Nuclear power plants and relations with local entities (site map; review of construction applications and modification of nuclear power plants regarding operating instructions and inspection standards, technical reports issued in this respect by CNEN, by competent administrations, and by the consultative bodies of the European Communities; technical questions inherent in the implementation of standards on plant safety and radiation protection; adoption of pertinent steps; relations with administrations, national entities, autarchic territorial entities, and community entities, regarding the technique involved in the nuclear industry, plant safety, development programs, associations and participations in enterprises and initiatives concering the peaceful use of nuclear energy, technological studies and industrial research; secretariat of Technical Commission of Releases for Nuclear Materials; special hiring system for personnel assigned to nuclear power plants.

Division X. Uranium, nuclear fuel, reprocessing (economic and industrial problems connected with nuclear manufacture; plans for the distribution of orders and commitments relative to the supply and reprocessing of uranium and nuclear fuels).

Division XI. Surveillance over CNEN (performance of ministerial surveillance function over National Nuclear Energy Committee; budget and relations of CNEN).

Division XII. Storage, use, trading and transportation involving radioactive substances. Radioactive waste (secretariat of Interministerial Coordinating and Consultation Council in the matter of plant safety and population protection; relations with the European Community in the matter of legal control over nuclear energy; civil responsibility connected with the peaceful use of nuclear energy; reports of stor e, use and trading authorizations, and memoranda on applications for export; horizations for transport, questions dealing with radioactive waste).

(4) Deputy Directorate for Conservation and Renewable Sources

Division XIII. Energy savings, measures to provide incentives in various consumption sectors (problems inherent in holding energy consumption down; initiatives and incentives in various consumption sectors);

Division XIV. Use of solar, geothermal, wind, and biomass energy forms (selection and determination of systems for the use of solar energy as well as geothermal energy, determination of various employment systems for wind energy and biomass, alcohol).

Division XV. Technological development, surveillance over activities of entities in sector of renewable sources conservation (problems connected with sector's technological problems; relations with agencies concerned; surveillance over activities of agencies).

Division XVI. Coal (studies for use of reactors for direct reduction of minerals, liquefaction, gasification--foreign and domestically produced mineral coal--derivatives of mineral coal distillation--estimate needs and quarterly balance sheets for community and ECE coal--community-level coordination of coal policy with general energy policy--application of community decisions concerning subsidies for coal from coke and for coke--coal committees, ECSC, OECD, ECE--tie-in with management of liquidation of National Association for Control of Combustion.

In addition to the 16 divisions just listed, the organizational structure of the directorate must include five offices directly under t director-general; they are as follows:

(a) Secretariat, General Matters and Coordination

Matters directly under the authority of the director-general; relations with the public regarding questions of a general nature; relations with agencies inside and outside the ministry and the directorate; personnel management; audit and accounting of budget chapters exclusively under the authority of the directorate; coordination of activities of individual offices in the directorate itself;

(b) Research, Data Bank, Data Processing Center

Studies and research in the various sectors of the directorate; collection and processing of data in these sectors themselves; statistics.

(c) Publications and Reports

Writing and publication of petroleum bulletin, national energy balance sheets, statistical bulletin on energy sources and industrial productions; other publications; dissemination of knowledge on systems suitable for holding energy consumption down.

(d) Legislation

Drafting outlines of standard-preparing bodies concerning the various sectors of the directorate; relations with the ministry's legislative office as well as with the appropriate government, parliamentary, and regional agencies; national standard adaptation to community standards in individual sectors under the authority of the directorate.

(e) International Relations

The directorate must, finally, be able to rely on a group of eight attached ministerial counsellors with specific functions listed below:

One for liquid and gaseous fuels;

One for emergency petroleum supply;

One for nuclear matters;

One for electrical matters;

One for methane developments;

One for coal;

One for conservation and savings;

One for solar matters.

The table below shows the personnel requirements in terms of job qualifications for each of the offices and divisions planned.

It should be noted that about 20 individuals with special professional skills are considered necessary, in other words, experts in a number of subjects.

1) Uffici	2) Laureati	3) Diplomati	4) Archivisti Segretarie	5) Copie	6) Autisti Commessi	Altri ecc	7) Totale
8) Direttore Generale	4		2	2	8		16
9) Affari Gen.le e Coordinamento	2	1	2	2	—		7
10) Studi, Centro di Calcolo, Banca dati	8	6	5	2	—		21
11) Pubblicazioni e rapporti	2	1	2	2	—		7
12) Ufficio Legislativo	2	—	1	1	—		4
13) Affari Internazionali	4		1	1	—		6
14) Consiglieri Ministeriali	8	—	8	8	—		24
15) Vice Direttore idrocarburi	1	—	1	1	1		4
16) div. 1°	5	2	2	3	—		12
17) div. 2°	4	2	2	1			9
18) div. 3°	3	1	1	1	—		6
19) div. 4°	3	1	2	1	—		7
20) Vice direttore Energia Elettrica	1	—	1	1	1		4
21) div. 5°	3	2	2	1	—		8
22) div. 6°	4	2	2	2	—		10
23) div. 7°	3	2	1	1	—		7
24) div. 8°	2	1	1	1	—		5
25) Vice direttore Energia Nucleare	1	—	1	1	1		4
26) div. 9°	3	2	2	2	—		9
27) div. 10°	3	2	2	1	—		8
28) div. 11°	3	3	1	1	—		8
29) div. 12°	2	1	1	1	—		5
30) Vice Direttore Conservazione e Fonti Rinnovabili	1	—	1	1	1		4
31) div. 13°	4	2	2	2	—		10
32) div. 14°	3	2	1	1	—		7
33) div. 15°	2	2	1	1	—		6
34) div. 16°	3	2	1	1	—		7
	84	37	49	43	12		225
35) perti fuori organico							20
							245

Directorate General of Energy Sources

Key: 1--Offices; 2--Phds; 3--MS, BS; 4--Files, secretariat; 5--Repro; 6--Drivers, clerks, miscellaneous; 7--Total; 8--Director-general; 9--General matters and coordination; 10--Research, computer center, data bank; 11--Publications and reports; 12--Legislative office; 13--International affairs; 14--Ministerial counsellors; 15--Deputy director for hydrocarbons; 16--First division; 17--Second division; 18--Third division; 19--Fourth division; 20--Deputy director for electrical energy; 21--5th division; 22--6th division; 23--7th division; 24--8th division; 25--Deputy director for nuclear energy; 26--9th division; 27--10th division; 28--11th division; 29--12th division; 30--Deputy director for conservation and renewable sources; 31--13th division; 32--14th division; 33--15th division; 34--16th division; 35--Nonorganic experts.

Appendix B. Chapter 5.7.

Tables Showing Actions Listed Under Individual Chapters and Indications as to Pertinent Action Instruments

Summary table of legal steps required in various action sectors, comprising laws both already in force, which can be properly amended or combined to make their use more decisive, and bills whose passage is necessary to carry out the planned actions.

The steps to be taken into consideration, in addition to those explicitly aimed at action in the energy sector, are also those that are shown for other purposes, such as Law 675 of 1977, but potentially usable in energy terms, or relating to other sectors, although they must be properly considered in the pertinent context.

Actions Provided for Under the Plan which Require Adoption of Legislative and Administrative Measures

Coal

Action Planned

1. Intensification of mining activities in Italy and abroad and pertinent support measures.

Development of Sulcis Coal Resources

2. Designation of sites where new coal power plants are to be installed.

3. (a) Increasing coal consumption through conversion:

Grant of allowances and/or financing [loans] at preferred rates for conversion of industrial plants;

Promotion, by central government, of coal conversion program for boilers used in big public utilities, involving the use of environmental emission control technologies or, in experimental or demonstration projects, the use of new burning technologies;

(b) Construction of infrastructure facilities (ports, storage and transportation, railroad and highway) and construction of necessary means of transportation (ships and railroads).

4. Supplementary revenues to be allocated to ECSC.

5. Increase in coal stockpiling at power plants.

Implementation Instruments

1. The cabinet has already approved a bill for the implementation of mining policy which calls for preferred treatment for the sector. The minister of industry recently requested the submission of this bill to parliament.

Regarding particularly the exploitation of the Sulcis coal fields, the industry minister will resubmit the standards contained in Article 51 of the lapsed Decree-Law 503/80, calling for a financial contribution in support of the mineral development projects.

2. The administrations of the central government and the local authorities concerned will, regarding their respective authority, work toward the proper site location of power plants provided for in the CIPE resolution of 11 January 1980.

Parliament is now debating Law AS No 702 (urgent steps for construction and operation of conventional thermoelectric power plants) which, regarding the construction of conventional thermoelectric power plants, calls for a procedure which is simplified as compared to those now in force. The industry minister will propose suitable adjustments to these regulations in order to come up with an adequate and simplified procedure for the site location of electric power plants of any kind and he will ask parliament to move quickly.

3. Concerning the overall implementation of these actions, the following have been planned and this involves drafting the following:

(a) By the Ministry of Industry, after hearing from ENEL and ENI, a study on terminals for receiving, storage, and sorting of coal;

(b) Scientific and technological research initiatives, featuring CNR and EEC research programs involving new coal use techniques, including the construction of experimental plants for the use of coal, both directly and through conversion products;

(c) By the Ministry of the Merchant Marine, after hearing from the ministries of public works and of industry, a program of port infrastructure facility construction;

(d) By the Ministry of the Merchant Marine, after hearing from the Ministry of Industry, [drafting] a program for the necessary adaptation of the ship transport capacity;

(e) By the Ministry of Transportation, after hearing from the ministries of public works and of industry, a general program for the adjustment of infrastructure facilities, primary depots and means of transportation in relation to the development of the market.

These programs will be drafted by the public administrations, using the support of the public entities and the possible cooperation of private operators who have considerable experience in the sector, after prior consultation with the regions concerned. The programs will have to be approved by the CIPE, following a prior opinion, where required, from the Interregional Consultative Commission.

(f) Submission to the cabinet, by the minister of industry, of subsequent legislative steps leading to the grant of allowances and/or financing at preferred rates for the conversion of industrial plants, for the construction of industrial demonstation and/or experimental plants, for feasibility studies, as well as financial,

support, and standardization measures which may be necessary to implement the programs for the construction of infrastructure facilities worked out in accordance with the preceding point.

4. A decree-law to be submitted for the purpose of increasing the allocation, to ECSC, of supplementary revenues for the budget for the years 1979-1980, or passage of a decree-law extending the coke subsidy system (Directive of 21 October 1980).

5. EEC directive implementation.

Gas

Action Plans

(1) Intensification of mining prospecting. Reduction of production levels to establish a strategic natural gas reserve.

(2) Methane development program for the South and its financing.

(3) Methane price policy taking into account a balanced relationship between the prices of the individual energy resources and the development of international prices on imported gas.

(4) Safety in use of gas for domestic purposes.

Implementation Instruments

The minister of industry shall submit to the cabinet a bill for the prospecting and development of liquid and gaseous hydrocarbons, according to the lines of a similar government regulation submitted in parliament during the last legislative session and with the provision calling for the extension of the duration of licenses and the possibility of varying the development programs so as to make it possible to set up and interconnect the various production levels (this step is also of interest to the petroleum sector).

2. Parliament is now in the process of passing bill AC No 2059, containing, in its Article 11, standards pertaining to the methane development of the South.

The first phase of the methane introduction program, which has already obtained a favorable opinion from the committee of presidents of the southern regions will be submitted to the CIPE by the minister of industry together with the standards pertaining to the methods and procedures of financing the program itself.

3. (See petroleum sector, point 6).

4. Amendments in Article 4, Law No 1083, dated 6 December 1971, concerning safety in the use of fuel gas for domestic purposes.

Nuclear

Planned Action

1. Institutional reform of CNEN (see also institutional part).

2. Location of electric power plants and identification of sites.

3. Establishment of strategic uranium reserves and pertinent expenses.

Implementation Instruments

1. See institutional part.

2. The administrations of the central government and the local authorities concerned will, regarding their specific authority, work toward the necessary siting of power plants already approved by the CIP in coordination with the CCIR.

In the meantime, the ministry of industry, in the course of the parliamentary debate on Bill AS No 702, will propose standards for the rationalization and speed-up of site selection procedures.

3. The minister of industry will submit to the cabinet a bill calling for the assumption, by the central government, of the financial burden deriving from the establishment of [strategic] stockpiles.

Petroleum

Planned Action

1. Guarantee of resupply and supply plan.

2. Development and boosting of research and development activities with liquid and gaseous hydrocarbons.

3. Inventory of possible other petroleum resources different from the traditional ones, such as oil shale and asphaltic rocks.

4. Rationalization and flexibility of refining, storage, and distribution systems.

(a) Completion and implementation of rationalization plan for refineries drafted by the Ministry of Industry in accordance with the 1977 PEN.

(b) Distribution of fuels: suspension of licenses; closing of marginal plants; establishment of an indemnification fund; incentives for the use of self-service facilities by the customers.

5. Adaptation of petroleum stockpiles.

(a) Adaptation of mandatory stockpiles;

(b) Establishment of strategic stockpiles of crude and/or products.

6. Gradual lifting of restrictions on petroleum product prices and subjection to the surveillance system.

7. Re-use of used oils.

8. Lead content of gasoline.

9. Exploitation and distribution of LPG.

Implementation Instruments

1. The minister of industry shall see to it that procedures currently in force for the arrangement of the annual supply plan are tightened up and made stricter.

2. The minister of industry will submit to the cabinet a bill for the prospecting and development of liquid and gaseous hydrocarbons according to the lines of a similar government regulation submitted to parliament during the last legislative session and with a provision calling for the extension of the duration of the licenses and the possibility of varying the development programs so as to permit the interconnection of production levels. (This regulation also involves the gas sector.)

3. The minister of industry, in coordination with the minister of state participations, will submit to the CIPE a resolution committing the ENI to conduct a basic study on the existence and development of resources on national territory.

4. Steps required for overall implementation of these actions.

The minister of industry has already drafted and, within 30 days, will submit the following to the cabinet:

(1) A DPCM [Decree of the Premier], containing a proposal for the suspension of licenses, the revocation, in two steps, of licenses pertaining to plants with an annual yield of less than 100,000 and 200,000 liters, as well as some amendments in the earlier DPCM of 8 July 1978 which provided orientation and directives for the regions;

(2) A DDL for the establishment of a mandatory indemnification fund among all operators in the sector, for the payment of contributions for spontaneous rationalization initiatives or in connection with the closing of plants.

5. (a) DDL AS 655 contains an express provision to increase the mandatory stockpiles to 100 consumption days.

(b) DDL AS [Senate Acts], No 655, in Article 17, contains the assignment of tasks along these lines to the ENI, with an allocation of 300 billion lire for the 2-year term.

The minister of industry shall propose an amendment to the article which will permit the use of the amount allocated for the purpose of having the necessary storage capacity.

6. The minister of industry will submit to the CIPE a directive designed once again to look into the advisability of switching all petroleum product prices from the control system to the surveillance system, with an indication of criteria on whose basis the CIP will have to exercise surveillance itself.

The proposed directive will also include the principles and relative implementation criteria for the maintenance of a balanced relationship between prices on individual energy resources.

At the same time the minister of industry will submit to the cabinet a DDL pertaining to the control agencies for the entire price sector, containing a reform of the CIP, its organization, and its territorial setup.

7. The minister of industry will submit a bill concerning the system for the collection and re-use of used oils.

8. By way of implementation of EEC Directive 78/611--which establishes the maximum content of lead in gasoline--the minister of industry will submit to parliament a pertinent bill.

9. The minister of industry will submit to parliament a bill amending and combining within Law No 7, dated 2 February 1973, new standards for the operation of stations handling the resupply and distribution of LPG in gas cylinders.

Renewable Sources and Substitute Fuels

Planned Action

1. (a) Drafting of a three-year program for the development of renewable sources.

(b) Development of demand through facilitation and other support measures (see also the savings and efficient energy use sector).

(c) Concerted action by public entities also through demonstation programs.

(d) Revision of single law on water and electric power plants.

(e) Liberalization of possibility of in-house production of electrical energy for hydroelectric power plants of up to 3,000 kw.

(f) Financial support for substitute fuel utilization systems, such as, for example, methanol.

2. System of research and development of geothermal resources.

Implementation Instruments

1. The implementation of all actions proposed will be assured through the passage of the four DDLs already being examined by the Senate under [Law] No 655 (standards on holding energy consumption down, development of renewable energy sources, and control of mandatory and strategic petroleum stockpiles), No 811 (provisions for soil protection and water management [control]), No 1132 (grant, to the CNEN, of a contribution for the development of renewable sources), and No 1288 (authorizing the ENEL to promote the application of solar water heaters for which the government will request approval on an urgent basis.

In connection with the discussion of DDL No 655, a standard will be proposed for funding [loan facilitation] for the use of substitute fuels.

The minister of industry will submit to the CIPE a resolution pertaining to the role of public entities in this sector, particularly aimed at the optimum utilization of resources.

2. The minister of industry will submit to the cabinet a DDL along the outlines of the similar government regulations submitted to parliament during the last legislature.

Saving and Efficient Use of Energy
(In Coordination with the Administrations Concerned)

Planned Action

Civilian Sector:

Financial subsidies in support of the demand for the adoption of an energy saving system;

Support for demonstration projects concerning the air conditioning of new buildings;

Support for the production of heat through combination of solar energy with gas or electricity;

Support for long-distance heating initiatives;

Incentives for the supply of energy services which progressively will replace the supply of traditional fuels;

Revision of current norms on housing construction and urban development.

Industrial Sector:

Incentives for demonstration projects aimed at energy savings and dissemination of results;

Incentives for investments in the energy savings sector in industry;

Incentives for the use of renewable sources in industrial processes;

Energy diagnosis service for small and medium industries.

Agricultural Sector:

Grant of contributions for the utilization of renewable energy sources;

Inventory of traditional and alternate energy resources present in individual agricultural areas;

Adoption of an experimental plan on the national level for the use of alternate energies through agricultural pilot establishments.

Stepping up applied research activities on the agricultural level.

Transportation Sector:

(1) Incentives for development, experimentation, and preliminary industrialization activities concerning prototypes and parts of transportation equipment and other durable items with low energy consumption capable of using energy sources other than petroleum;

(2) Improvement of energy efficiency of motor pool;

(3) Action involving the treasury;

(4) Recycling of transportation equipment;

(5) Efficiency control over inventory, speed limits, emission standards;

(6) Improvement of infrastructure facilities connected with transportation;

(7) Institutional action and coordination.

Implementation Instruments

Civilian Sector

The implementation of all of the actions here is guaranteed by DDL AS 655, containing among other things standards on the content of energy consumption and the development of renewable energy sources currently being examined by parliament. DDL 1288, likewise being examined by parliament, calls for the dissemination of plants ready to make more efficient use of energy and to save energy, as well as the use of renewable sources in final consumption sectors.

DDL 1288 furthermore provides for the establishment of companies or corporations between ENEL, public entities, and local entities for the construction and operation of electric energy generation, transformation, and distribution plants, including plants for the combined production of electric energy and steam.

The minister of industry will submit a standard along those lines in connection with the parliamentary discussion on DDL AS 655.

The minister of public works is in the process of establishing a mixed commission with the ministry of industry and enlarged to include the representatives of the regions and the ANCI [National Association of Italian Municipalities] to study amendments to the national and regional standard which may become necessary due to the implementation of energy policy objectives provided for in the plan also through new norms for the application of Law 175/78 (10-year housing plant).

Industry Sector

The implementation of all of the actions here is guaranteed by DDL AS 655, containing among other things standards on the content of energy consumption and the development of renewable energy sources as well as DDL 1132 which will finance the activities of the CNEN in the sector.

As a result of the passage of a pertinent horizontal plan, use will also be made of the incentive provided for in Law 675/77 (Law for Industrial Reorganization and Conversion).

With the cooperation of more experienced operators in this sector, the minister of industry is drafting a plan for experimentation and demonstration to be disseminated in that sector.

Agricultural Sector

A standard providing incentives for the use of renewable forms of energy and agriculture has already been received by the restricted committee which is examining DDL AS 655; the minister of agriculture, in coordination with the minister of industry, will submit to the cabinet a bill aimed expressly at the use of renewable sources in agriculture. The funds mentioned in DDL 1132 can also be used for this purpose.

In the meantime, the CIPAA will adopt all those directives which can immediately be put out in connection with the application of Law No 984/77 (Agricultural Development Law)

Transportation Sector

1. For the shortrun and for the transportation equipment production sectors, for which we expect approval of a sector plan within the meaning of Law No 675, incentives for innovative activities, aimed at energy savings through the implementation instruments of the individual finalized programs to be provided for urgently.

For the more long-range requirements and for the transportation equipment production sectors not included in the steps provided for under Law No 675, incentives [to be provided] through the Special Fund for Applied Research (Law No 1089, dated 25 October 19[illegible]), following expansion of field of operations.

2. Provision by the Ministry of Transportation to supply contributions for vehicle diagnosis.

3. Provision by Ministry of Finance to modify the current vehicle tax according to criteria taking into account energy consumption.

4. Provision for the implementation of the horizontal program on the recycling of materials provided for in Law No 675.

5. Amendments to the Highway Code and action on community level.

6. In coordination with the minister of public works and after hearing from the Interregional Consultative Commission, the minister of transportation shall, within 6 months, submit the following to the cabinet:

A DDL for the establishment of traffic movement plans for urban centers and for the pertinent funding;

A DDL establishing transportation plans and the pertinent funding, extending the content of the standards to Article 2, Law 1042/69, for metropolitan [transportation systems];

Rapid implementation of railroad plans (Law No 377/74, Law No 503/50, and Chamber DDL No 1488), port plans (Law No 366/74), and airport plans (Law No 299/79 and Law 825/73).

7. The transportation minister shall establish an appropriate interministerial commission to study and redefine the areas of authority and the reorganization of the public entities within the context of an overall sector plan.

Production Processes Involving Heavy Electric Energy Consumption

Planned Action

Determination of forms of supporting industrial activities with heavy energy consumption in relation to the expenditures they have due to the high cost of electric energy, said burden being assumed by the central government.

Implementation Instruments

The Ministry of Industry shall propose directives to the CIPE for the identification and listing of industrial activities to be supported and for the determination of the extent and type of intervention. The ministry, possibly in coordination with the other ministries concerned, will submit the necessary proposals of a legislative nature so that the central government will take care of the expenditures pertaining to such forms of support.

Institutional Aspects

Planned Action

1a. Establishment of the Interministerial Committee for the Emergency and subsequent action.

1b. Expansion of the task of the CCIR (Interregional Consultative Commission).

1c. Reorganization and expansion of General Directorate of Energy Sources under the Ministry of Industry.

2. Institutional reform of CNEN, including assignment of new tasks in the field of renewable sources and energy savings, on the other hand taking out safety and control functions.

3. Combination of tasks of ENEL in sector of renewable sources promotion.

4. Preparation of national energy research program, also including a chapter particularly pertaining to alternate sources and efficient use of sources (expressly provided for in the Chapter on Research Activities).

5. Reorganization of tasks and public functions in sectors such as the hydrographic, meteorological, seismic, and ecosystems sectors.

6. Coordination, by Industry Ministry, of documentation and information in the matter of energy. This action is specifically spelled
Information).

Implementation Instruments

1. All of the actions indicated will be submitted to the CIPE by the minister of industry. Their specific implementation will take place after the approval debate and, to the extent necessary, through resolutions of the cabinet and/or through legislative steps.

2. Concerning the new tasks in the field of renewable sources:

(a) The CIPE on 29 April 1980 approved the guidelines for the 1980-1984 CNEN Plan, calling for the extension of the agency's activities to the renewable energy and energy savings sector;

(b) The cabinet approved and already submitted to parliament two bills for financing the CNEN progam (AS 1132) and for the transformation of the CNEN into the National Committee for Nuclear Energy and Alternate Energy Sources--ENEA--(AS 1128).

Concerning the removal of safety and control activities, the minister of industry, in coordination with the other ministries concerned, will submit a suitable bill authorizing the government to establish an agency which would gradually perform these activities in all "high-risk" sectors.

3. Amendments to the institutional law of the ENEL contained in DDL 1288 furthermore providing for an increase in the agency's fund allocations.

4. The minister for scientific and technological research will submit to the CIPE the program now being finalized.

5. The minister of industry, in coordination with the ministers of public works, of merchant marine, and of defense, will submit to the cabinet, within 60 days, a government authorization bill.

6. The minister of industry will propose directives to the CIPE to be addressed to the ENI, the ENEL, the CNEN, and other public or private operators, so that the individual information, dissemination, and/or updating initiatives may coordinate their respective activities.

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21 April 1981